Railway Maintenance Engineer

Volume 18 CHICAGO—OCTOBER, 1922—NEW YORK Number 10

Note the Line

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RAIL ANTI-CREEPERS

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(ENGLAND) LTD
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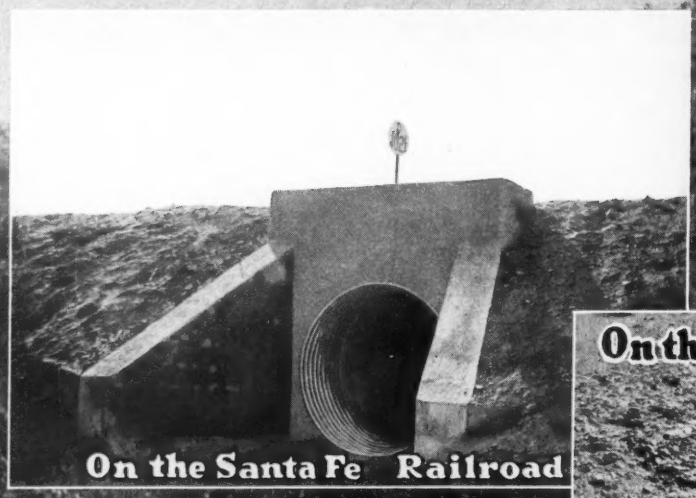
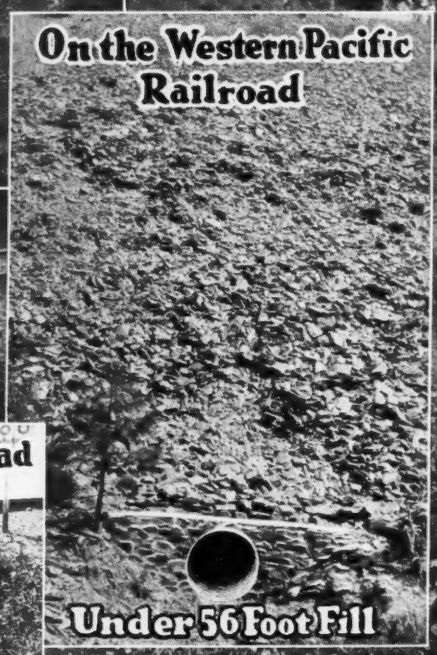


On the Santa Fe Railroad

On the Western Pacific Railroad



Under 56 Foot Fill

On the Great Northern Railroad

Installed in 1910

ARMCO CULVERTS

ARMCO Ingot Iron

There is a manufacturer in nearly every state, and in Canada, making genuine rust-resisting ARMCO CULVERTS and other products of Armco Ingot Iron such as flumes, siphons, tanks, road signs, roofing, etc. Write for full information and nearest shipping point on products in which you are interested.

ARMCO CULVERT & FLUME MFRS. ASSN.

215 NORTH MICHIGAN AVE. CHICAGO

RAILWAY MAINTENANCE ENGINEER

Entered as second-class matter June 22, 1916, at the post office at Chicago, Ill., under the Act of March 3, 1879. Published Monthly by Simmons-Boardman Publishing Company at 608 S. Dearborn St., Chicago. Subscription price, United States, Canada and Mexico, $2.00 a year; foreign countries, $3.00 a year.

Alphabetical Index to Advertisements Page 5 Classified Index of Advertisers, Pages 5 and 6

RAMAPO IRON WORKS
Established 1881

AJAX FORGE COMPANY
Established 1883

Announcement

RAMAPO AJAX CORPORATION

is a consolidation of Ramapo Iron Works and Ajax Forge Company operating under the same sales and executive managements as heretofore, with general offices at the Hillburn Works, near New York City.

The five works of this organization are located as follows:

HILLBURN, NEW YORK
CHICAGO, ILLINOIS
NIAGARA FALLS, N. Y.
SUPERIOR, WISCONSIN

NIAGARA FALLS, ONT.

A subsidiary Canadian plant, operated under the name of Canadian Ramapo Iron Works, Limited.

RAMAPO AUTOMATIC SAFETY SWITCH STANDS
AJAX MANGANESE ONE-PIECE GUARD RAILS

and other specialties developed by these companies, as guard rail clamps, double shoulder solid bottom switch riser plates, etc., may be obtained through the works at any of the above five locations as well as standard switch, frog and crossing work in open hearth steel, cast manganese and rolled manganese rail construction.

Our policy shall be to cooperate with our customers in the improvement of the design and construction of our products for safety and economy in railroad operation and not only to maintain, but to improve, if possible, the reputation so long established by the Ramapo and Ajax companies under their individual names.

RAMAPO AJAX CORPORATION, HILLBURN, NEW YORK

2503 Blue Island Ave.
CHICAGO

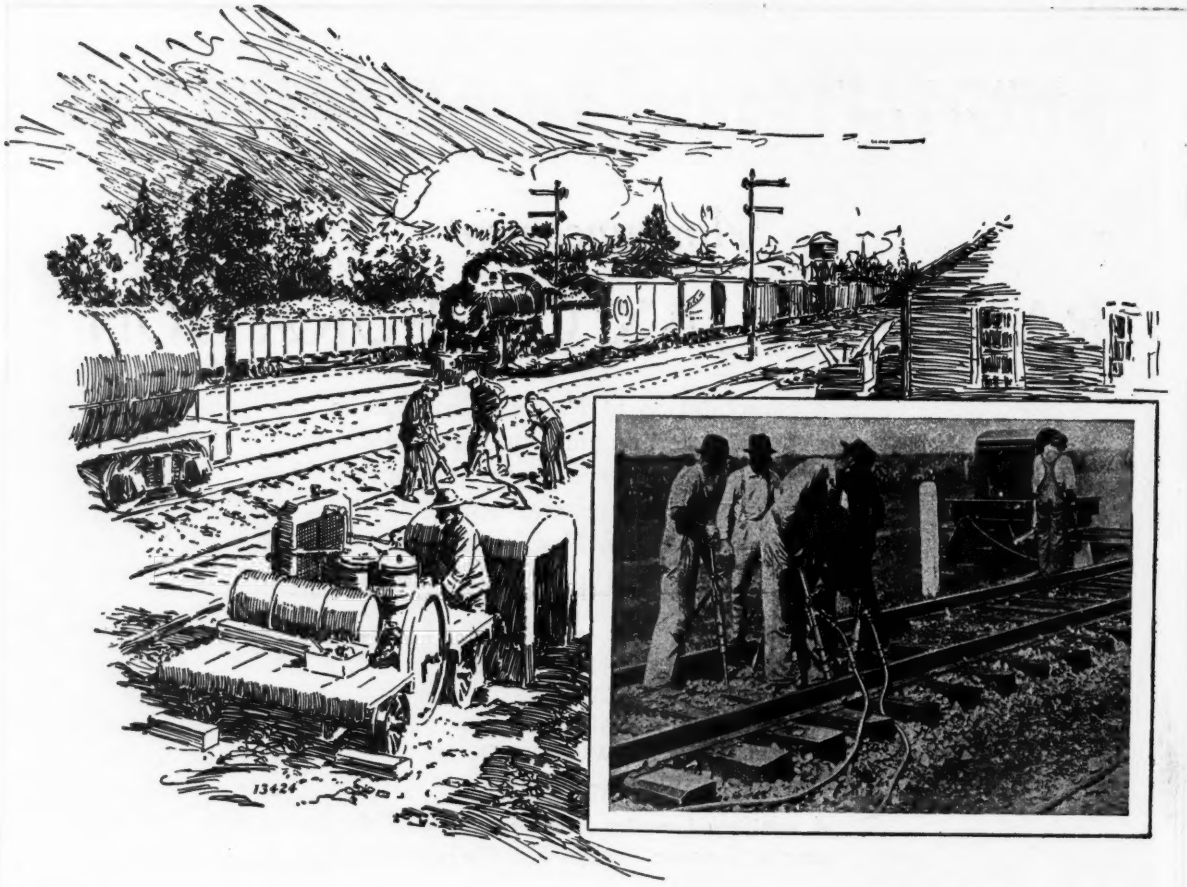
30 Church Street
NEW YORK

McCormick Building
CHICAGO

NIAGARA FALLS, N. Y.

SUPERIOR, WIS.

Canadian Ramapo Iron Works, Limited, Niagara Falls, Ont.



New Standards in Track Efficiency

"Imperial" Pneumatic Tie Tampers, first of all, tamp the track so that it stands up two to three times as long as hand tamped track, and is also uniform and smoother.

The better track is obtained with less labor and in less time. Four men with "Imperial" tampers tamp more track in a day and do a better job than sixteen men with ordinary picks and bars.

Better track, that lasts much longer, produced with less labor and in less time and with a resulting saving in the final costs, is the reason for the adoption of "Imperial" Tampers as the standard equipment for hundreds of track maintenance gangs.

INGERSOLL-RAND COMPANY, 11 Broadway, New York

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Ingersoll-Rand

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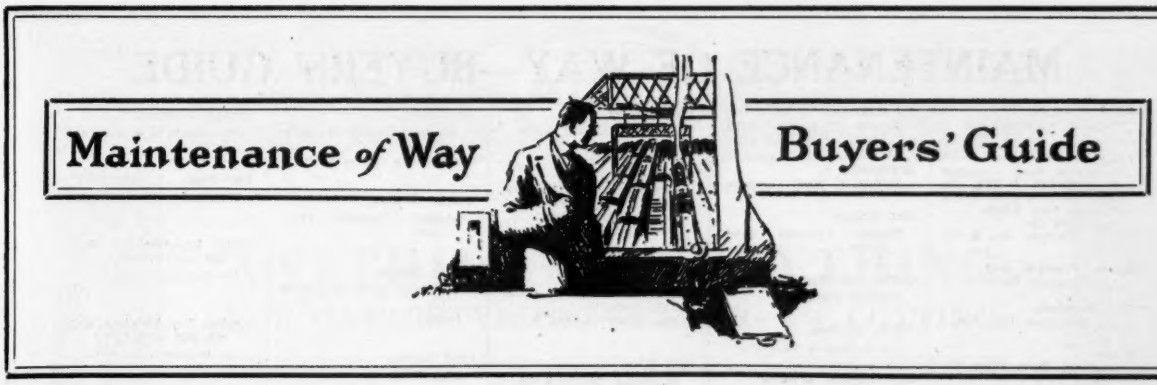

ALPHABETICAL INDEX TO ADVERTISEMENTS

A

Air Reduction Sales Co..... 7
American Hoist & Derrick Co..... 15
American Valve and Meter Co.... 9
American Well Works..... 11
Armco Culvert and Flume Mfrs. Assn. 2

B

Bethlehem Steel Company..... 21
Blaw-Knox Co..... 12

D

Diamond State Fibre Co..... 15
Du Pont de Nemours Co., E. I..... 18

F

Fairmont Gas Engine and Ry. Motor Car Co..... 10
Frog, Switch and Manufacturing Co., The 20

G

Goulds Manufacturing Co., The.... 12

H

Headley Good Roads Co..... 22

I

Indiana Piston Ring Co..... 10
Ingersoll-Rand Co. 4
Inland Steel Company..... 22
International Creosoting & Construction Co. 16

K

Kilbourne & Jacobs Mfg. Co..... 13

L

Louisville Frog & Switch Co..... 20
Lundie Engineering Corp..... 22

M

Massey Concrete Products Corp... 21

N

National Lock Washer Co., The... 23
New Jersey Zinc Co., The..... 19

O

Osgood Co., The..... 12

P

P. & M. Co..... 1

R

Rail Joint Co., The..... 20
Ramapo Iron Works..... 3
Ruberoid Co., The..... 12

S

Sullivan Machinery Co..... 8

V

Verona Tool Works..... 24

W

Warren Tool & Forge Co..... 8
Weir Frog Co., The..... 20
Wharton & Co., Wm., Jr..... 22
Woolery Machine Co..... 10

CLASSIFIED INDEX OF ADVERTISERS

Acetylene, Dissolved.
Air Reduction Sales Co.

Adjustable Rail Clamps.
Wm. Wharton, Jr., & Co.

Air Aftercoolers.
Ingersoll-Rand Co.

Air Compressors.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Hoists.
Ingersoll-Rand Co.

Air-Lift Pumping Systems.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Anchors.
P. & M. Co., The

Anti-Creepers.
P. & M. Co., The.

Apparatus, Brazing, Welding and Cutting, Heat Treatment.
Air Reduction Sales Co.

Argon.
Air Reduction Sales Co.

Asphalt.
Ruberoid Co., The.

Asphalt Shingles.
Ruberoid Co., The.

Barrels.
Diamond State Fibre Co.

Bars.
Bethlehem Steel Company.

Benders, Rail.
Verona Tool Works.

Billets.
Bethlehem Steel Company.

Blasting Powders.
E. I. du Pont de Nemours & Co.

Blasting Supplies.
E. I. du Pont de Nemours & Co.

Blow Pipes, Oxy-Acetylene.
Air Reduction Sales Co.

Bolts.
Bethlehem Steel Company.

Bond Wire.
Armco Culvert & Flume Mfrs. Assn.

Brazing.
Air Reduction Sales Co.

Buckets.
Blaw-Knox Co.

Buildings, Sectional, All Steel.
Blaw-Knox Co.

Building Papers.
Ruberoid Co., The

Burners, Bunsen, Acetylene.
Air Reduction Sales Co.

Calcium Carbide.
Air Reduction Sales Co.

Cars, Motor, Inspection.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Indiana Piston Ring Co.

Cars, Motor, Section.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.

Cars, Velocipede.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Indiana Piston Ring Co.

Cars, Dump.
Kilbourne & Jacobs Mfg. Co.

Castings.
Bethlehem Steel Company.

Cattle Guards.
Fairbanks, Morse & Co.

Cattle Passes.
Massey Concrete Prod. Corp.

Chisels, Track.
Warren Tool & Forge Co.

Clutch Linings.
Diamond State Fibre Co.

Coaling Stations.
Fairbanks, Morse & Co.

Compromise Joints.
Bethlehem Steel Company.

Condensers.
Ingersoll-Rand Co.

Conduits.
Diamond State Fibre Co.

Corrugated Iron.
Armco Culvert & Flume Mfrs. Assn.

Crossings, Highway Bituminous.
Headley Good Roads Co.

Crossings.
Bethlehem Steel Company.
Louisville Frog & Switch Co.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Culverts.
Armco Culvert & Flume Mfrs. Assn.

Culvert Pipe, Concrete.
Massey Concrete Prod. Corp.

Curbing.
Massey Concrete Prod. Corp.

Cutting, Oxy-Acetylene.
Air Reduction Sales Co.

Derails.
Wm. Wharton, Jr., & Co.

Ditchers.
American Hoist & Derrick Co.
Osgood Co., The.

Dynamite.
E. I. du Pont de Nemours & Co.

Drill Steel, Rock.
Ingersoll-Rand Co.

Drop Forgings.
Bethlehem Steel Company.

Engines,
Fairbanks, Morse & Co.

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Fairmont Gas Engine & Ry. Motor Car Co.

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Massey Concrete Prod. Corp.

Float Valves.
American Valve & Meter Co.

Flux.
Air Reduction Sales Co.

Forgings.
Bethlehem Steel Company.

MAINTENANCE OF WAY—BUYERS' GUIDE

Forge Hammers.
Sullivan Machinery Co.

Frogs.
Bethlehem Steel Company.
Frog, Switch & Mfg. Co.
Louisville Frog & Switch Co.
Ramapo Iron Works.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Gages, Pressure, Gas.
Air Reduction Sales Co.

Gas, Acetylene.
Air Reduction Co., Inc.

Gears.
Diamond State Fibre Co.

Generators, Acetylene.
Air Reduction Sales Co.

Girder Rail.
Bethlehem Steel Company.

Grinders (Portable).
Ingersoll-Rand Co.

Guard Rails.
Bethlehem Steel Company.
Louisville Frog & Switch Co.
Ramapo Iron Works.
Wm. Wharton, Jr., & Co.

Guard Rail Clamps.
Louisville Frog & Switch Co.
Ramapo Iron Works.
Weir Frog Co.

Hand Cars.
Fairbanks, Morse & Co.

Hand Car Engines.
Fairmont Gas Engine & Ry. Motor Car Co.

Hammer Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.

High Tee Rail.
Bethlehem Steel Company.

Hoists.
Fairbanks, Morse & Co.

Hose.
Air Reduction Sales Co.

Insulated Rail Joints.
Rail Joint Co.

Junction Boxes.
Massey Concrete Prod. Corp.

Jacks.
Fairbanks, Morse & Co.
Verona Tool Works.

Machinery.
Bethlehem Steel Company.

Machinery, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Manganese Track Work.
Bethlehem Steel Company.
Louisville Frog & Switch Co.
Ramapo Iron Works.
Wm. Wharton, Jr., & Co.

Manholes.
Massey Concrete Prod. Corp.

Markers.
Massey Concrete Prod. Corp.

Mile Posts.
Massey Concrete Prod. Corp.

Motor Cars.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Indiana Piston Ring Co.

Nitrogen.
Air Reduction Co., Inc.

Nut Locks.
National Lock Washer Co.

Nuts.
Bethlehem Steel Company.

Oil Engines.
Bethlehem Steel Company.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Oil Houses.
Massey Concrete Prod. Corp.

Ordnance.
Bethlehem Steel Company.

Out Houses.
Massey Concrete Prod. Corp.

Outfit, Rail Bonding.
Ingersoll-Rand Co.

Outfit, Welding.
Air Reduction Sales Co.

Oxy-Acetylene Welding
Air Reduction Sales Co.

Oxygen.
Air Reduction Sales Co.

Paints.
New Jersey Zinc Co.
Ruberoid Co., The.

Pavement Breakers.
Ingersoll-Rand Co.

Penstocks.
American Valve & Meter Co.

Pig Iron.
Bethlehem Steel Company.

Piling.
Massey Concrete Prod. Corp.

Pinions.
Diamond State Fibre Co.

Pipe, Cast Iron.
American Casting Co.

Pipe, Concrete.
Massey Concrete Prod. Corp.

Pipe Carriers.
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Pipe Joint Compound.
Ruberoid Co., The.

Plants, Welding and Cutting.
Air Reduction Sales Co.

Pneumatic Tie Tampers.
Ingersoll-Rand Co.

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Poles, Concrete.
Massey Concrete Prod. Corp.

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E. I. du Pont de Nemours & Co.

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Massey Concrete Prod. Corp.

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International Creosoting & Construction Co.
New Jersey Zinc Co.

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Air Reduction Sales Co.

Pumps.
American Well Works.
Fairbanks, Morse & Co.
Goulds Mfg. Co., The.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Push Cars.
Fairbanks, Morse & Co.

Rails.
Inland Steel Company.

Rail Anchors.
P. & M. Co., The.

Rail Anti-Creepers.
P. & M. Co., The

Rail Benders.
Fairbanks, Morse & Co.

Rail Braces.
Bethlehem Steel Company.
Louisville Frog & Switch Co.
Ramapo Iron Works.
Weir Frog Co.

Rail Joints.
American Chain Co., Inc.
Rail Joint Co.
Wm. Wharton, Jr., & Co.

Rail Saws.
Fairbanks, Morse & Co.

Rare Gases.
Air Reduction Sales Co.

Regulators, Oxy-Acetylene.
Air Reduction Sales Co.

Riveting Hammers.
Ingersoll-Rand Co.
Verona Tool Works.

Rivets.
Bethlehem Steel Company.

Rock Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works.

Rods, Welding.
Air Reduction Sales Co.

Roof Slabs.
Fairbanks, Morse & Co.
Massey Concrete Prod. Corp.

Roofing and Siding.
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Ruberoid Co.

Screw Spike Drivers.
Ingersoll-Rand Co.

Sewer Pipe.
Massey Concrete Prod. Corp.

Sewer Pipe Seal Compound.
Ruberoid Co., The.

Sheets, Fibre.
Diamond State Fibre Co.

Sheet Iron.
Armco Culvert & Flume Mfrs. Assn.

Sheet Steel.
Inland Steel Company.

Signal Foundations, Concrete.
Massey Concrete Prod. Corp.

Slabs, Concrete.
Massey Concrete Prod. Corp.

Smoke Stacks.
Massey Concrete Prod. Corp.

Spikes.
Bethlehem Steel Company.
Inland Steel Co.

Standard Tee Rails.
Bethlehem Steel Company.
Inland Steel Co.

Standpipes.
American Valve & Meter Co.
Fairbanks, Morse & Co.

Station Houses.
Massey Concrete Prod. Corp.

Steam Shovels.
American Hoist & Derrick Co.
Osgood Co., The.

Steel Forms.
Blaw-Knox Co.

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Bethlehem Steel Company.

Step Joints.
American Chain Co., Inc.
Rail Joint Co.

Street Railway Special Work.
Bethlehem Steel Company.

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Inland Steel Company.

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Bethlehem Steel Company.
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American Valve & Meter Co.

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Massey Concrete Prod. Corp.

Switch Stands.
Wm. Wharton, Jr., & Co.

Switchstands and Fixtures.
American Valve & Meter Co.
Bethlehem Steel Company.
Fairbanks, Morse & Co.
Louisville Frog & Switch Co.
Ramapo Iron Works.
Weir Frog Co.

Tampers.
Ingersoll-Rand Co.

Tanks.
Fairbanks, Morse & Co.

Tank Valves.
American Valve & Meter Co.

Telegraph Poles.
Massey Concrete Prod. Corp.

Telephone Booths.
Massey Concrete Prod. Corp.

Ties.
International Creosoting & Construction Co.

Tie Plates.
Bethlehem Steel Company.
Inland Steel Company.
Louisville Frog & Switch Co.
Lundie Engineering Corp.

Tie Rods.
Bethlehem Steel Company.

Tie Spacers.
American Chain Co., Inc.

Tin Plate.
Bethlehem Steel Company.

Tongue Switches.
Bethlehem Steel Company.

Tool Steel.
Bethlehem Steel Company.

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Air Reduction Sales Co.

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Air Reduction Sales Co.

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Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Track Insulation.
Diamond State Fibre Co.

Track Jacks.
Verona Tool Works.

Track Material.
Inland Steel Company
Louisville Frog & Switch Co.
Ramapo Iron Works.
Weir Frog Co.

Track Scales.
Fairbanks, Morse & Co.

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Fairbanks, Morse & Co.
Verona Tool Works.
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Trestle Slabs.
Massey Concrete Prod. Corp.

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Varnish, Electrical Insulating.
Ruberoid Co., The

Washers.
Diamond State Fibre Co.

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American Valve & Meter Co.

Waterproofing.
Ruberoid Co., The.

Welding, Oxy-Acetylene.
Air Reduction Sales Co.

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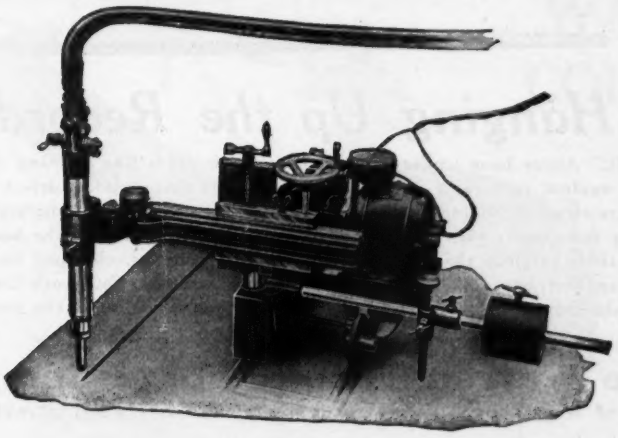


SERVICE

ECONOMY

AIRCO-DAVIS-BOURNONVILLE RADIAGRAPH

MACHINE cutting is one of the greatest achievements of Airco-Davis-Bournonville in the advancement of the oxyacetylene industry.

The Radiagraph, Oxygraph, Camograph, and Pyrograph are some of the exclusive machines designed by Airco-Davis-Bournonville experts for mechanical cutting of steel plates, forgings, dies, etc.

The No. 1A Radiagraph, illustrated above, is a portable, motor-driven machine which may be used for cutting along straight or curved lines at constant speed adjusted according to thickness of plate and size of torch-tip used. There are ten variations of speed, and iron or steel of all thicknesses from ¼ to 20 inches or more may be so cut.

The Radiagraph provides greatly increased production and reduced operating costs in fabricating plants, steel mills, boiler shops, bridge works, and locomotive and car shops. The Airco Consulting Engineering Staff will be pleased to discuss with manufacturers and others the advantages of specially designed machinery for mechanical cutting and welding.

Special Bulletin, illustrating and describing mechanical cutting on production work, will be sent on request.

Write for Airco booklet:
"Anything and Everything for Oxyacetylene Welding and Cutting"

AIR REDUCTION SALES COMPANY

Manufacturer of Airco Oxygen — Airco Acetylene — Airco-Davis-Bournonville Welding and Cutting Apparatus and Supplies, Acetylene Generators, and Specially Designed Machines for Automatic Welding and Cutting — Nitrogen, Argon and other Airco Atmospheric Gas Products.

Controls the manufacture and sale of National Carbide

Home Office: 342 Madison Avenue, New York, N. Y.

Airco District Offices, Plants and Distributing Stations conveniently located throughout the Country.

"Airco Oxygen and Acetylene Service is Good Service."

QuikwerK TOOLS

Hanging Up the Records

"HACK DEVIL" Adzes have undergone extreme tests—feats like striking 100 blows on spikes driven in against rails, and cutting the heads off a dozen spikes driven in a tie. Quikwerk Track Chisels have stood 10,000 blows on rails without needing redressing during the test or after it. Quikwerk Lining Bars, put under 800 pounds pressure, with a 2" bow in the bar, have returned to within 1/32" of their original shape. Quikwerk Track Wrenches, clamped on a nut with over a quarter of a ton applied, haven't slipped, spread, bent or broken. Quikwerk Claw Bars, inserted on a spike firmly held, have stood the weight of 4 men without spreading of the toe or other defect.

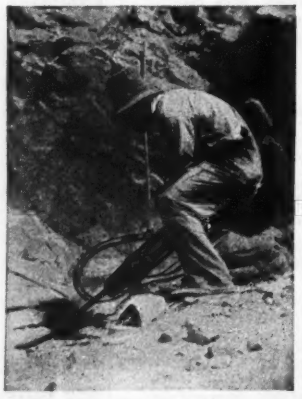
These tests illustrated in our Track Tool Folder—write for one

The Warren Tool & Forge Company

Maintenance of Way Tools 243 Griswold Street, Warren Ohio

DIG YOUR ROCK with ROTATORS

The Sullivan all-around one-man hammer drills



For tearing out concrete
Use Rotators

For shallow holes in trenches
Use Rotators

For deep holes on benches
Use Rotators

For any drilling in railroad grading
Use Rotators

For light tripod or quarry bar drilling
Use Rotators

Rotators weigh 38 lbs., drill holes to 14 feet readily, and may be had in seven models to suit the work to be done.

Rotators are hard on the rock, but easy on the runner.

Bulletin 1970-W

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411 Gas Building, Chicago

Mr. Manufacturer—

Clear Track Ahead!

No Strike Signals to Cloud the Annual Convention of

The Roadmasters' Association

Postponed from September 19-21 to November 21-23

Is your product to be represented in the December number of the Railway Maintenance Engineer, the official publication of reports and papers to be presented at the convention? Consider—a larger attendance, a keener interest! Railroad men interested in maintenance of way materials at the convention and those at home will read the December number of the Railway Maintenance Engineer from cover to cover. Bring your product to the attention of these men.

RAILWAY MAINTENANCE ENGINEER,
608 So. Dearborn St., Chicago.

Save Time in filling your tenders
Prevent damage from Water Hammer

WITH THE

POAGE Style H WATER COLUMN

An Instantly Adjustable Spout

Quicker work in filling tender tanks is possible with the Poage Style H Water Column equipped with the Fenner drop spout.

A vertical range of five feet and a lateral range of three feet make accurate spotting of the tender unnecessary.

The spout works equally well with tenders of different heights.

The spout avoids the usual winter troubles in cold climates. It has a non-freezable telescopic joint. This is entirely open. There is no packing of any sort. Yet it does not leak or waste a drop of water.

Quick Closure Without Water Hammer

Even on high pressure water mains, the Poage Style H Valve is closed quickly without danger to the mains from water hammer. The flow is cut down 85 per cent very rapidly and the remaining 15 per cent more slowly.

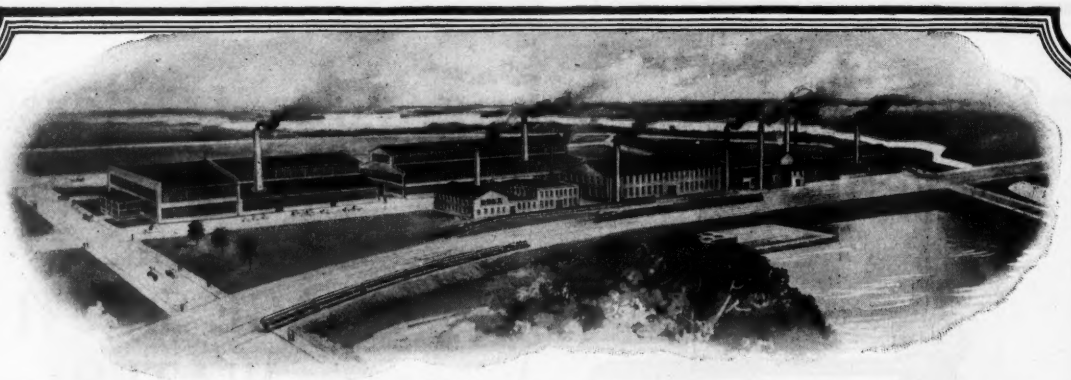
Tests by the University of Illinois have shown that this principle provides the quickest closure and makes water hammer impossible.

Investigate the Poage Style H water column. Give it a thorough trial.

Manufactured exclusively by

The AMERICAN VALVE & METER CO.

Cincinnati, Ohio



Largest Exclusive Railway Motor Car and Engine Factory in the World

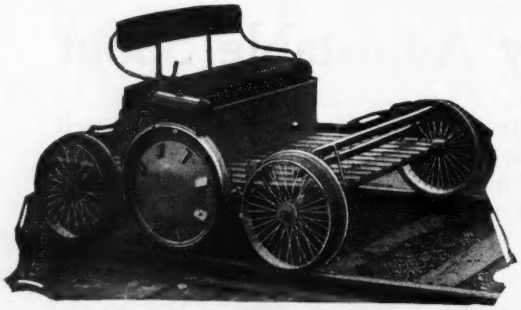
The FAIRMONT factory is the largest plant in the World devoted exclusively to the production of railway motor cars and engines. Over 23,000 FAIRMONTS on 700 railway systems shows what the industry thinks of the FAIRMONT. "Performance On the Job Counts."

Let us tell you how FAIRMONT will cut maintenance expense and increase efficiency. Write

FAIRMONT GAS ENGINE & RAILWAY MOTOR CAR CO., Dept. C-10, FAIRMONT, MINNESOTA

Fairmont

Ball Bearing Motors and Railway Motor Cars



THE TEETOR RAILWAY SPEED CAR

Motor Driven

And Weighs Only 200 Pounds!

THE first essential of a railway inspection car is light weight—light enough to be lifted from the track by one man. The Teetor Railway Speed Car weighs only 200 pounds—and it is motor driven. It is easily controlled, economical to operate, rides easily, and is strong and durable. Write for full information.

SPECIFICATIONS

Weight	—200 pounds
Pass. Capacity	—Two Persons and Equip.
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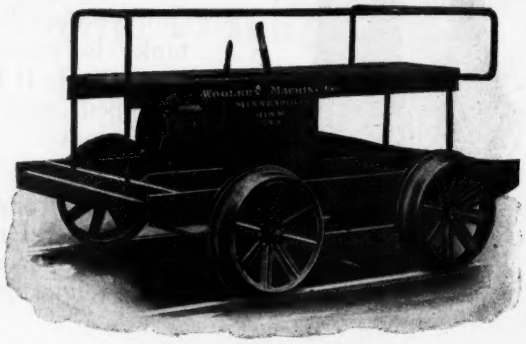

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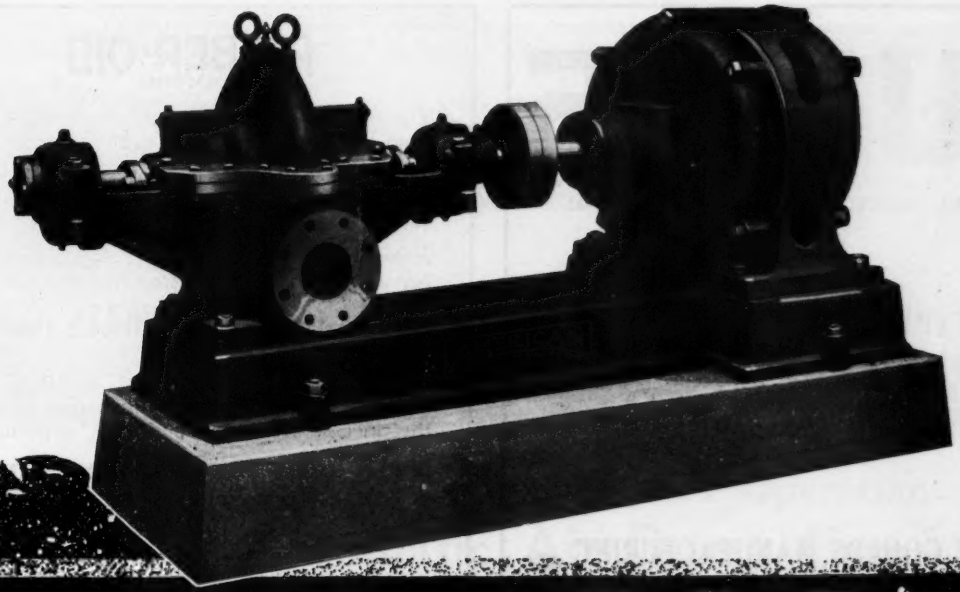

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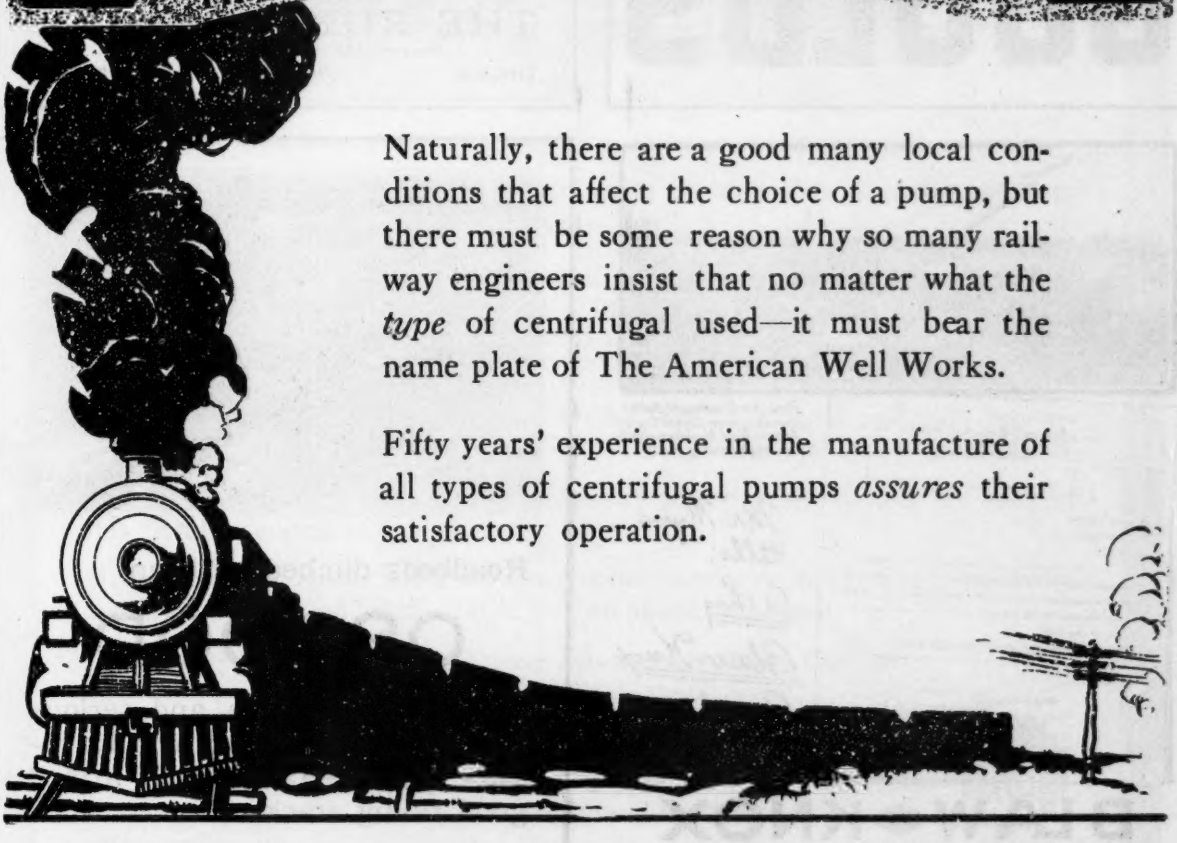

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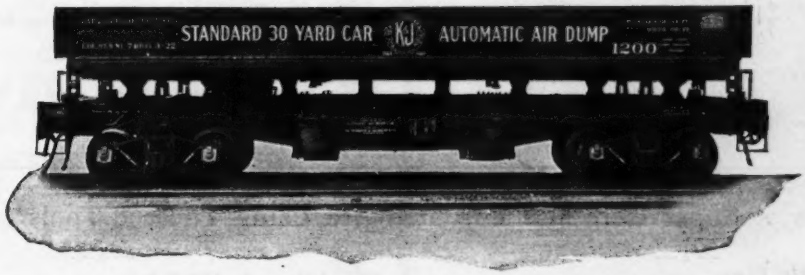

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1,034,418—Aug. 6th, 1912.
1,057,413—Apr. 1st., 1913.
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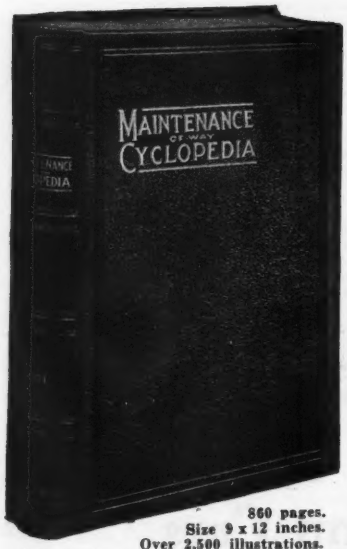

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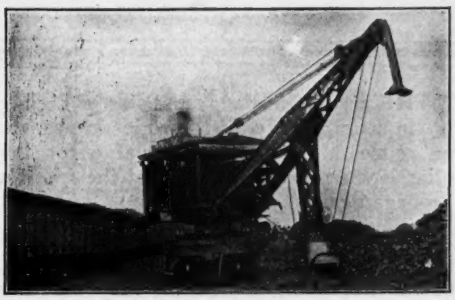

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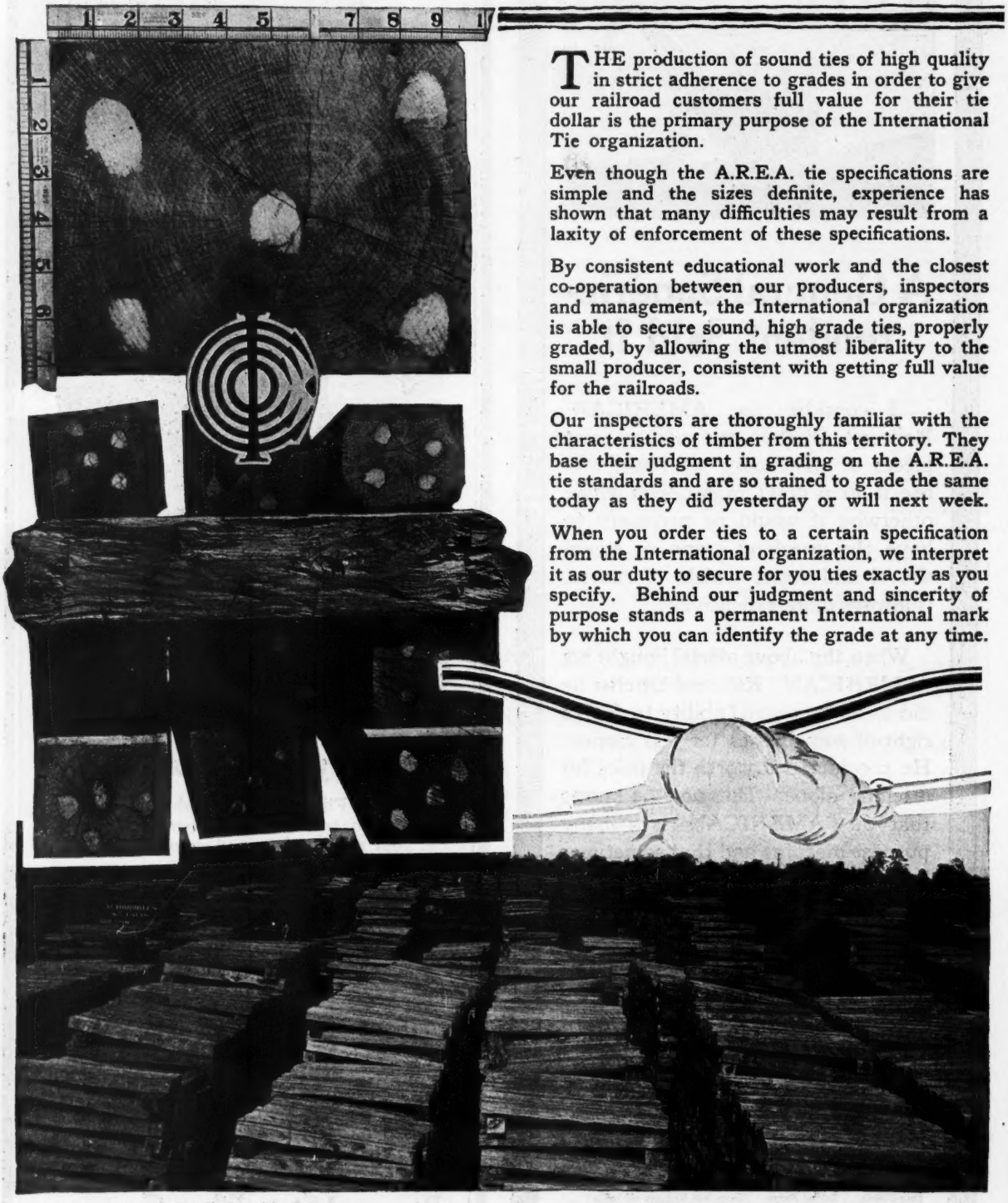

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Railway Maintenance Engineer

Vol. 18 October, 1922 Number 10

TABLE OF CONTENTS

EDITORIALS 333
LETTERS TO THE EDITOR 335
NEW BOOKS 336
HOW TO HANDLE AND LAY CONCRETE PIPE; PAUL KIRCHER 337
HOW THE B. R. & P. WATCHES SWITCH LAMPS 340
WHAT DO YOU DO WITH YOUR TIME AFTER SIX O'CLOCK? WALTER S. LACHER 341
METHODS THAT GET RESULTS IN BITUMEN ROAD CROSSINGS; JOHN STANLEY CRANDELL 342
EXTENSIVE WATER TREATING FACILITIES ESTABLISHED ON THE ST. PAUL; C. HERSCHEL KOYL 344
AN UNUSUAL PROBLEM IN MOVING RAILROAD TRACK .. 347
CLEANING TRACK WITH A POWER SWEEPER 347
PROMOTING THE ART OF MAKING GOOD CONCRETE; D. A. TOMLINSON 349
A TEMPORARY PASSENGER STATION OF UNUSUAL DESIGN 352
WHAT'S THE ANSWER? 354
SPRINKLING TRACK FOR PASSENGER TRAINS 357
LABOR BOARD WILL SOON ISSUE DECISION ON WAGES ... 358
NEW DEVICES 359
ASSOCIATION ACTIVITIES 362
THE MATERIAL MARKET 362
THE NEWS OF THE MONTH 363

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If the speed of the mixer affects the strength of concrete?
If track can be cleaned with a power sweeper?
How to lay dust on sandy track?
Answers to these and other practical questions will be found elsewhere in this issue.

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(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age* and *Railway Engineering and Maintenance of Way.*)

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WE GUARANEE, that of this issue 7,850 copies were printed; that of these 7,850 copies, 7,086 were mailed to regular paid subscribers, 57 were mailed to advertisers, 30 were mailed to employees and correspondents, and 677 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 71,900, an average of 7,190 copies a month.

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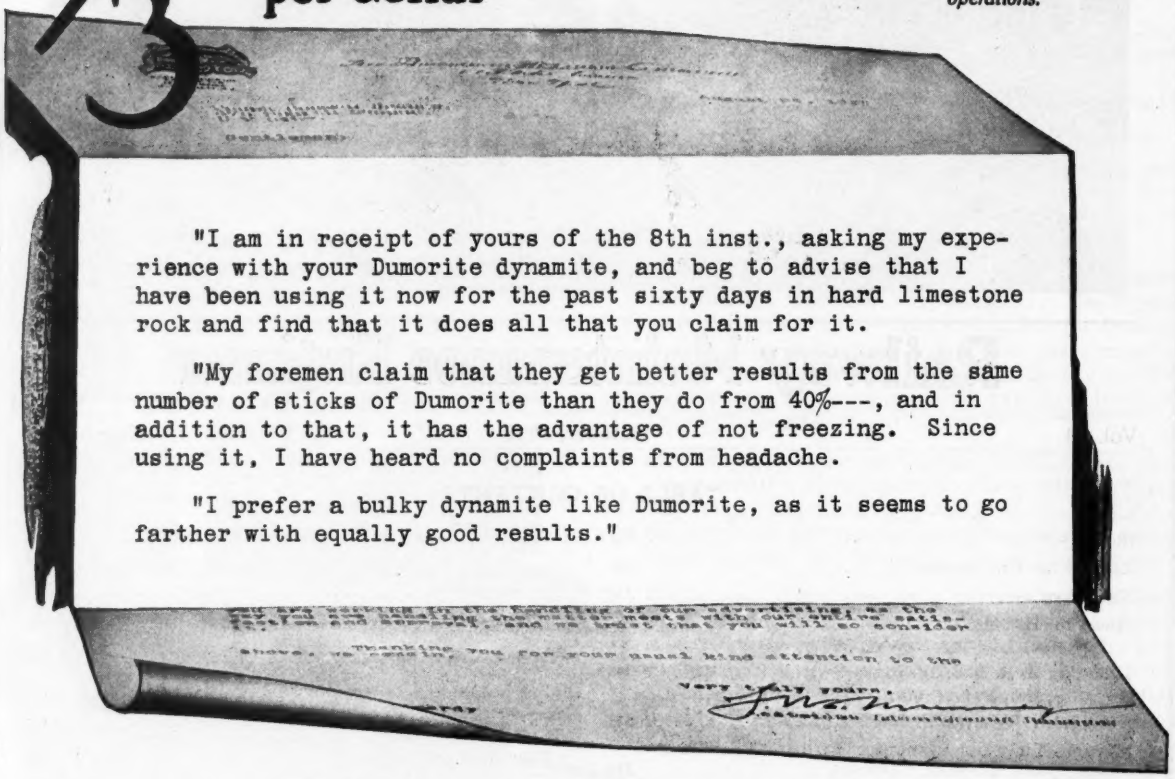

"I am in receipt of yours of the 8th inst., asking my experience with your Dumorite dynamite, and beg to advise that I have been using it now for the past sixty days in hard limestone rock and find that it does all that you claim for it.

"My foremen claim that they get better results from the same number of sticks of Dumorite than they do from 40%---, and in addition to that, it has the advantage of not freezing. Since using it, I have heard no complaints from headache.

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Railway Maintenance Engineer

Maintenance Materials Cost More

The advance in the price of open-hearth rails from $40 per gross ton to $43 announced by the United States Steel Corporation on September 15 serves to emphasize the pronounced change in the market for materials which has taken place in the six months from February to September of the present year. While almost everyone is more or less alive to the fact that prices have advanced during this period, it is not out of place to call attention to some of the specific changes which have occurred. Structural steel has advanced almost 50 per cent, tie plates are 28 per cent higher and track spikes 20 per cent above the price of six months ago. But still greater changes have taken place in the case of lumber. Items in common use by the railroads range from 25 to 60 per cent higher in cost than they did in February and March. Cement prices have advanced 10 to 15 per cent. Still more marked is the change in the prices of scrap. Thus in February the price at Chicago, of scrap rail less than three feet long ranged from $12.50 to $13; the same material is now quoted at $21.50 to $22. Scrap steel angle bars which brought $10.50 to $11 in February are now quoted at $18.50 to $19. This change in the aspect of the material market not only exerts a marked influence on estimates for work to be undertaken, but points to the need of forehandedness in ordering material because the congested condition of the market makes delivery extremely slow.

Organizations—Divisional and Departmental

The time worn discussion of the relative merits of departmental and visional organizations is being now revived in a somewhat unusual quarter, namely, on the railroads of England. Judged by American standards, the English railroads, as they have been organized up to the present, are relatively small properties. Although intensively developed and carrying extremely dense traffic, they cover limited areas and from the standpoint of supervision, the system officers are in much the same position as the chief officers of the smaller railways in America, namely, they can have personal access to all parts of the system and be entirely familiar with the physical property as a whole. For this reason, the departmental form of organization has prevailed. Now, however, the proposed consolidation of the railroads into several groups comprising a mileage much larger than that of any of the individual railroads as now constituted introduces new problems of management. It will no longer be feasible to expect a chief engineer to be familiar with all details of the enlarged property, nor can he be held to account for the detailed conduct of maintenance of way and construction activities. This has led to proposals for the adoption of a divisional organization providing for the more concentrated exercise of authority by the equivalent of the American division superintendent. A study of the advantages and disadvantages of this form of organization as analyzed in England serves to emphasize some of the difficulties of management under which maintenance of way operations are conducted, but which have long been accepted in this country as one of the unavoidable complexities of railway transportation. The divisional organization is admittedly imperfect, but most railroads have found it the best form which has thus far been devised.

Before the Cold Weather Arrives

On those roads in the northern states on which staff meetings of local maintenance of way officers with their foremen are in vogue, snow fighting may now well become an important topic for consideration. The old saying that "an ounce of prevention is better than a pound of cure" is as true here as elsewhere. The first cold wave or storm usually finds some point unprotected and operation is interfered with unnecessarily as a result. After a storm breaks it is too late to order equipment or to make alterations to plant or track layouts. These must be anticipated beforehand as must also the necessity for the organization of forces. It is these advance preparations which are now of importance and which must be started even though the temperature suggests little of winter. Equipment must be secured where past experience has shown that it is needed, that on hand must be overhauled and put in proper condition so that it will not fail at the critical time of need, forces must be so organized and lined up that the minimum specific instructions are required after the storm breaks. These arrangements are necessary from the standpoint of a division officer; they are equally necessary locally on each section. The division engineer and roadmaster must know those points where the obstacles are the greatest and give them special consideration. Each foreman must study his local section in the same thorough manner and remove as many potential points of trouble as possible in order that he may be able to concentrate on those which are unavoidable. This is the time to prepare. When the blizzard arrives it is too late.

Getting a Dollar's Worth of Results

On another page of this issue, an article on the laying and handling of reinforced concrete culvert pipe presents some valuable information on a much neglected subject. This article very correctly places strong emphasis on the necessity for exercising proper care in this work if the purchaser is to obtain full value for the money expended for the pipe. The fact that a portable type of construction is being substituted for a concrete culvert built in place is no excuse for disregarding any considerations of the foundation. Enough care must be taken in studying the site of the proposed culvert, in determining what character of foundation should be prepared for it, and in taking the necessary steps to insure that the work is completed according to the plan determined upon. It is a curious thing that, expressed in general terms, a yielding foundation is more desirable for concrete pipe than a rigid one and that solid rock imposes the most severe loading condition on the pipe. These and other considerations discussed in the article referred to above make it well worthy of serious study by those in charge.

WHAT DID THIS YEAR'S WORK COST?

IF THERE is one kind of information which railway men in direct charge of or supervising construction and maintenance of way work lack more than any other it is that regarding the cost of their operations. This is due in large measure to the fact that the materials which they use are bought by another department, while the records of the expenditures are compiled by still another department and are brought to the attention of the maintenance officer only when some question arises. This dearth of specific data reacts adversely on the cost of railway work for no man can look for leaks unless he knows that they are present and has some indication as to where he should begin to search.

No contractor could succeed long without keeping the question of cost continually before him. However, even though the railway organization is such that this information is not brought before the man on the ground in a way and at a time to be of help to him, he can collect some valuable cost data by his own efforts. The active working season is now drawing to a close and many projects are being completed. On such it is possible for a man familiar with the work to collect information which will give him a fair index of unit costs. With such information he can set about to devise ways to reduce these costs next season. It was only after the magnitude of the cost of traffic delays to rail laying operations was ascertained that the economy of turning one track on multiple track lines over to the maintenance force was realized. So it is with many other operations. The demands for more results per per dollar of expenditure will increase rather than diminish and these demands can be met only by the man who knows how the dollar is being spent. At this season of the year, when the information is available and the pressure of field work is decreasing, the alert maintenance man will analyze his results.

UNITED IN A COMMON PURPOSE

A railway is built to transport freight and passengers. The extent to which it serves the public in this manner is determined by the number of tons of freight and the number of passengers which it carries. The roads are now confronted with all of the traffic which they can handle and more. It is then the duty of every employee to do his work so as to aid in the handling of this traffic. This can be done by keeping the tracks and structures in the best possible shape, by using the least number of cars and locomotives for non-revenue service, by decreasing the necessity of slow orders to the minimum consistent with safety, etc. Work not contributing to the movement of traffic can be done when there is less business to handle. A railway is a complex organization with many departments and branches of work and with an army of employees intent upon their respective duties. It will succeed best only when these activities are all directed to the one common purpose. If every employee will now concentrate on the one objective of aiding in moving traffic not only will the public be served best, but the railroad from which he derives his living will prosper and he will benefit accordingly.

IMPROVING CONCRETE PRACTICE

ELSEWHERE in this issue we publish the first of a series of articles on good practice in the making of concrete. The facts therein presented are by no means new, representing principles that have been developed from time to time as the results of tests, and experiments have become available. However, it is only too true that there is a wide disparity between the conclusions generally accepted by concrete specialists and the actual practices of the men directly engaged in the proportioning, mixing, placing and curing of this important construction material. This condition is one for which the constructor is not to blame. The fault has lain primarily in the failure to disseminate the scientific conclusions in a form that can readily be understood by the man on the firing line. In too many cases, the information has been given out in involved treatises which only a few have the hardihood to read in their entirety, much less to understand. It is only because those who are primarily interested in the promotion of good practice in concrete work have gradually come to appreciate this condition, that steps are now being taken to give greater publicity to facts concerning the methods for making good concrete in a form in which it will be most readily received by those who will derive the greatest good from reading it. The articles are a step in this direction.

HOW MUCH OF A WINTER FORCE?

NO CONDITION detracts more from the efficiency of the maintenance of way department than the large turnover in force, much of which is the result of wide fluctuations in the number of men employed, brought about by the drastic reductions at the first frost. This practice is strongly intrenched in the minds of many railway men because of the fact that it has always existed and its necessity is therefore taken for granted. Yet some officers who have studied this problem and have come to the conclusion that the year's work can be so arranged that a considerable part of it can be done almost, if not equally, as well during the winter as in the summer, and that the savings effected by holding a larger number of experienced men in service far outweighs such loss in efficiency as may result from the more adverse weather.

It is at this time of the year when the usual seasonal reduction of force is approaching that the change in methods must be made if at all. Conditions are particularly promising for the introduction of a change of this character this year. There is work pressing for attention on almost every road, much of which can be done during the winter. The roads are enjoying and will undoubtedly continue to enjoy good earnings for some time and they are therefore in a position to carry a larger force if convinced that the money spent now will save as much or more next summer. With the expected continuation of the revival in construction there will be a demand for men again next summer which will deplete and probably exhaust the reserve from which the roads draw their temporary seasonal forces and may make necessary the postponement of desired work because of inability to secure labor.

Before a maintenance of way officer can request for a larger winter force with any hope of success he must prepare a definite program of work which can be done during the winter. The initiative rests with this officer, system or local, whose first step is to formulate this program of work, the performance of which at this time will offer marked benefits next spring. Prompt action is necessary if large seasonal reductions in force are to be avoided. With a carefully proposed program this plan holds much of promise.

CLEANING BALLAST MECHANICALLY

T IS doubtless only a question of time until the majority of the roads will be using mechanical equipment almost entirely for the performance of much of the maintenance work now carried on chiefly with hand labor. A task now commonly delegated to hand labor is that of cleaning ballast, only a few roads utilizing some form of mechanical equipment for this purpose. It is not straining a point too hard to predict that eventually a machine or several machines will be developed which will do this work thoroughly and economically. However, waiting for the perfect machine to be marketed or otherwise brought into existence is doubtful economy for any road on which the problem of foul ballast is an ever-present and serious one. Various means have been tried to clean ballast by means of mechanical equipment, an example of which is the use by a few roads of locomotive cranes and clam shell buckets in conjunction with power-shaken and gravity-operated screens. While admittedly not a perfect means, a saving over hand labor methods has been secured which has varied in amount according to the conditions under which the work has been prosecuted. Following the idea that any saving in cost is worth the trouble of going after it, it would seem good practice to study this method and where practical to apply it until something better is developed. Another factor of growing importance which has a bearing upon the problem of cleaning ballast is that of the future available labor supply. In this respect it is of interest to point out that in one locality, the shortage of labor was so great this season that the tracks of one road serving that territory would have suffered considerably if it had not been for the use of this method of cleaning ballast.

TWO KINDS OF LEADERSHIP

THE organizations of railway shop employees known as the railway shop crafts refused to abide by the decisions of the Railroad Labor Board relative to wages and struck on July 1. It is now evident that their strike has been lost. The individual members are seeking their old positions at the wages which they refused to accept three months ago and with the loss of seniority and other valuable privileges. As a result of this strike the public has suffered through interference with railway service, the roads have been forced to make vast expenditures and the men have undergone a tremendous loss in earnings and in many cases of their positions permanently.

On the other hand, the organization of maintenance of way employees, whose members were also confronted with a reduction in wages, refused to accede to the pressure from the shop crafts leaders and the minority of its own members and did not strike. While contending that the reduction in wages was too drastic, the leaders of this organization held their men at work and following the method of procedure laid down in the Transportation Act, obtained a rehearing of their cases in an orderly manner, with the result that it is expected that they will be granted an increase. If this conjecture proves correct they will have gained peaceably what the shop employees failed to secure by the tactics which they employed in their effort to bring about a condition of affairs more to their liking than that created by the Board.

Neither public nor roads have suffered, while the men lost neither their wages nor their positions. The outcome of this controversy is a victory for conservative leadership, the lesson of which should be borne home to every member of the maintenance of way organization.

Letters to the Editor

MAINTAINING UNIFORM SURFACE

Amarillo, Tex.

TO THE EDITOR:

I have been reading the various interesting and instructive articles discussing the requisites of good track and the methods of obtaining the highest efficiency. It is conceded that the foundation of permanent track rests with the proper construction of the roadbed originally, with fills and embankments of sufficient strength and finished with good materials, cuts and borrow pits adequately drained, and a well settled roadbed with the source of all water pockets eliminated. This is crowned with a sufficient depth of first class ballast upon which the cross ties and rails rest in their support of the wheel thrust.

After the ties and rails have been properly placed to standard spacing and gage, comes the uniform surfacing and leveling of the rails and the uniform tamping of the ballast under the ties, which is the prime requisite of permanent good riding track, for without uniform surface of the rails and true cross levels no track can ride well regardless of the perfection of the roadbed, the quality of cross ties or the weight of the rails, and without good tamping and uniform placing of the ballast under the ties, track will not long remain in uniform surface. Irregular surface of the rails soon results in irregular alinement of the rails and uneven gage of the track.

This irregularity of cross leveling the rails which will develop progressively into reversing side lops under traffic is the result of improper methods in leveling the rails and tamping the ballast under the ties. When the sighting rail is lifted to surface face, sufficient care is not always used with the level board to see that the cross level is perfect and that both rails are tamped to a perfect level. Quite frequently when the lifting jacks are released one rail will be left a shade high or a shade low and on the next jack set it will probably be left the reverse. This accounts for the slightly irregular cross levels which under traffic will develop progressively in a short time into reversing side lops which cause permanently poor riding track and expensive future maintenance. Great care should always be used to insure that the track is absolutely level when the tamping is done.

Another and the greatest source of irregular track levels is irregular tamping of the ballast under the ties, due to the method usually followed in tamping and finishing track. In almost all extra gangs, and especially gangs of foreign laborers, not more than fifty per ecnt of the laborers will do good uniform tamping and filling under the ties, while the others are medium and inferior tie tampers. As new laborers are added to the gang, they are generally worthless in the beginning, and ties tamped by such an unequal organization will not long retain levels, for good tamping under one rail and poor tamping of the opposite can only result in lop-sided track in a short time. The method usually pursued in surfacing track with such an organization is to raise the track to face, space and square up the ties, make the necessary tie renewals, and start the mixture of unskilled labor to tamping the ties outside of the rails and when the work is sufficiently under way, a portion of the gang is assigned to finish the tie tamping between the rails. This method is wrong and can only result in progressively poor riding track with heavy future maintenance costs.

The proper method to pursue in general resurfacing and renewing ballasted track with an extra gang organiza-

tion, and the method which has proven to be the most economical and durable, is to do no tamping inside or between the rails until the end or outside tamping has been done and all tie renewals made, including the replacing of tie plates. Then after sufficient traffic has passed over it to depress the spots of inferior tamping and bed the tie plates on all newly plated and replated ties, drop back and use the track level to prove up the cross levels again, raise all low spots to a true level, retamp the ends of the ties outside of the rail, retamp all loose ties up to the rail where the tie plates have bedded and follow with the finished tamping between the rails.

Track surfaced and finished by this method has true cross levels and uniform tamping, as it has all been rolled down under traffic and the tie plates bedded, and the inferior tamping has been reinforced by the second tamping to a true cross level, which will insure good riding track and will require very little spotting up for two or three years. W. H. CLEVELAND,

General Track Inspector, Atchison, Topeka & Santa Fe.

SIMPLIFYING ENGINEERING DEPARTMENT REPORTS

TO THE EDITOR: Chanute, Kansas.

The necessity for retrenchment in all departments has brought about many improvements in methods which have tended to eliminate unnecessary work. This has been true in the engineering department as elsewhere in railway service. At one division point which has come under my observation the engineering department, before retrenchment, consisted of five field parties of three men each, a division engineer, an office engineer, an assistant engineer, a stenographer, a blue printer, a maintenance clerk, and an estimate clerk. The division engineer spent the greater part of his time on the road, working in conjunction with the division superintendent. The office engineer supervised the field and office forces, and the assistant engineer was responsible for payrolls, leases, special assessment work, etc. The field men carried small time books in which they recorded the work performed and expenses incurred daily and at the end of the week all field men reported at the office and wrote up their records of work performed during the week in a general record book and made out their traveling expense statement on the standard form. At the end of the month the assistant engineer copied the time distribution from the record book into a standard payroll book and then prepared the payroll.

This method was in use for several years, but increasing work made necessary the adoption of more efficient means. The new system that was devised, and the one in use now, relieved the field men of all office work in this connection, relieved the assistant engineer of all payroll work and, with subsequent perfections in the system, eliminated the need of the blue printer, thus effecting a saving of $95 per month on the payroll.

The form illustrates what is now in use by the field men and represents a report blank that has been shaped from several that were used during a trial period.

The reports are mailed each night and on the following morning are received and checked by the office engineer, who segregates the time and expenses chargeable to additions and betterments after which they are turned over to the stenographer, who transfers the time distribution to the general pay roll book and also writes off the expense items on the standard expense forms. Thus the pay roll book and expense forms are always up to date and there are no delays at the pay roll period in getting the books to the general timekeeper. J. B. STAGG.

Departed from	Hour	Train	Arrived at	Hour	Nature of Field Work	Hour From	Hour To	Total Train Time	Total Field Time	Total Meal Time	Total All Time

Dated ..... 19 .... Report of .....
(Town) (Dated) (Name) (Title)

EXPENSES

Item	Location	Rate
Breakfast		
Dinner		
Supper		
Lodging		

Will tie up at..... Give names of party below
(Town)

.....

.....

Will work tomorrow on.....

Will tie up tomorrow night at.....

Form for Field Engineer's Daily Report

NEW BOOKS

Proceedings of the American Wood-Preservers' Association, 1922. 534 pages of text, 53 pages of advertising, 6 in. by 9 in. Illustrated. Bound in cloth or paper. Published by the American Wood-Preservers' Association, S. D. Cooper, secretary, c/o Atchison, Topeka & Santa Fe, Topeka, Kan. Price, cloth $6, paper $5.

This is the report of the eighteenth convention of the American Wood-Preservers' Association and contains a complete record of the various committee reports, papers and discussions, presented at the convention held in Chicago on January 24, 25 and 26, 1922. From the standpoint of the railway reader, the volume this year is of greatest value because of the amount of space devoted to the economics of timber preservation so far as it concerns railway cross ties. Committee reports and personal papers presented and discussed at the convention in Chicago on January 24, 25 and 26, as reported in the proceedings, include such topics as the Economics of Cross Tie Renewal, Factors Affecting the Cost of Treated Cross Ties, the Feasibility of Introducing Tropical Ties in the United States, the Experience with Treated Wood on the Santa Fe, Should the Cost of Treating Ties Be Charged to Maintenance or Capital Account? etc. Bridge and building officers who have occasion to deal with structures in sea water will be also interested in the report of the committee on wood borers in San Francisco bay. As in previous years, the proceedings also included a report by the Committee on Plant Operation, covering such problems as the handling of ties and timbers from the cars to the storage piles, etc., while the usual number of papers were presented on subjects relating to more technical features of wood preservation. The statistical section covers 33 pages.

How to Handle and Lay Concrete Pipe

A Consideration of the Strain to Which the Pipe Is Subjected in the Embankment

By Paul Kircher
Massey Concrete Products Corporation, Chicago

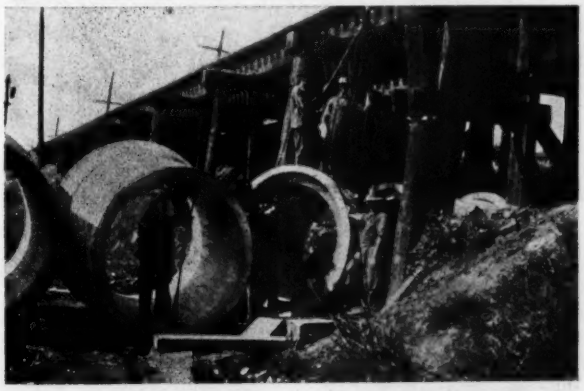
What Not to Do—Lines of Pipe so Close Together That They Cannot Be Properly Bedded

THE EXACT forces to which concrete culvert pipe are subjected in service are practically impossible to predetermine. They vary with the nature of the material in which the pipe is laid, the percentage of moisture, the method of making the fill, etc. They vary both in magnitude and direction. To measure them is difficult.

Properly designed and manufactured concrete pipe has so thoroughly demonstrated its efficiency for culvert purposes under all conditions during the past 15 years, that there is a tendency on the part of many railroad men to overlook the necessity for care in handling and laying it. No matter how well concrete pipe may be designed and built, however, it cannot give the service of which it is capable unless it is handled and laid with due regard to its limit of strength. This discussion is intended to show the principles governing the successful use of concrete pipe and to point out some features of field practice which experience has taught us to be desirable. The recommendations made are to be understood as applying, however, only to pipe of high quality and strength.

Pipe Is Strongest in Compression

In common with all concrete structures, concrete pipe is most useful when subjected only to strains of compression and shear. This is the condition which is approximated when a pipe is immersed in water. The worst condition of loading is when all the load is applied at two opposite points. In this case only a small fraction of the wall can act in compression. It is always important, then, in laying concrete pipe to seek to make the pressure uniform on all sides.



A Block and Tackle and Skids Are Needed When Power Equipment Is Not to be Had

In ordinary practice, the load is the weight of the material above the pipe which is resisted by the supporting soil under the pipe. There are three principal methods of improving this condition so that it approaches more nearly the ideal of fluid pressure on all sides.

(1) Thorough tamping of the material around the pipe and to some distance either side of it increases the radical supporting power of the lower half of the pipe and distributes the load over a greater arc.

(2) If a fill can settle more at the sides of the pipe than it does over the top, it will drag down the earth directly over the pipe and increase the load. If it can settle less it will decrease the load on the pipe by supporting some of the fill directly over it. If a fill is less compact over the pipe than at the sides the portion over the pipe will be carried more largely by the material alongside until it exerts a load greater than the supporting material can bear, which will produce motion in the fill. This motion will not all be downward, but sideways as well, and will thereby create some horizontal pressure on the pipe.

(3) Pipe that is laid in soft material will not fail as quickly as that laid on rock, for by settling into the material, the pressure is reduced. In laying pipe in hard material, therefore, a softer fill should be placed in the excavation immediately under the pipe.

Three Classes of Railway Service

There are three types of installations which include most of the culvert work handled by the maintenance department and an effort will be made to show briefly how the principles outlined above are applied to these three classes of work.

(1) Where old wooden box culverts are replaced with concrete pipe, the problem is comparatively simple for the fill does not have to be disturbed. It has usually been in place for some time and had opportunity to settle and become stable. The floor of the old wooden box should be removed and a bed prepared for the pipe by excavating a semi-circular channel which will conform as closely as possible to the contour of the bottom of the pipe. Transverse excavations should then be made for the bell of the pipe so as to relieve it of excessive loading and distribute the load uniformly along the length of the pipe.

It is desirable to use the largest pipe that will fit into the old box. If, then, the material is filled in and tamped around each section of pipe as it is laid, there will be little

danger of a failure when the wood has so decayed that it ceases to resist the earth pressure, and the pipe begins to take the load. However, owing to the fact that this material cannot be packed as tight as that in the surrounding fill, the culvert will never take a large part of the load of the fill.

(2) The installation of concrete pipe to replace old

A Hole Through the Top of the Pipe Affords a Convenient Means of Lifting

wooden trestles is probably the most common type of culvert work in the maintenance field and in many respects is similar to that found in new construction work. The pipe should be laid a little below the natural ground line, the excavation for the bed being made as described above. Where rock is encountered, the bed should be formed by blasting out a sufficient depth to allow placing a layer of earth under the pipe.

Where the material is plastic, as in a swamp, a supporting foundation must be provided. Pile bents are preferable, these supporting at least three rows of stringers shaped to conform to the surface of the pipe. If one stringer is placed at the bottom and one at either side some 60 deg. distant, the pipe is supported over one-third of its surface. This tends to produce the same result as the tamping of the material at the sides when laying pipe in earth.

In making the fill over the pipe, the first thing to remember is to tamp the material carefully around and on both sides. Precautions should be taken to see that no large boulders or chunks of frozen or saturated earth are dumped on the pipe or used to backfill around it. The filling around and over the top of the pipe to a depth at least equal to the diameter of the pipe should be of good material placed in layers and well tamped to minimize the strains due to settlement of the fill. The tamping on either side should be more compact than immediately over the pipe so as to get the support of the material alongside the pipe early in the settlement of the fill.

(3) The third class of culvert work is the installation of pipe in new locations either in cuts or fills, to take care of changed drainage conditions, to enlarge the waterway opening, or to provide a cattle pass. Frame or pile bents are placed, according to the height of the fill, and the least possible excavation made. The preparation of the bed and the backfilling around the pipe are the same as discussed above. In this type of work the question frequently arises as to the distance which should be allowed between two lines of pipe. It is best to leave sufficient space between two adjacent lines to allow workmen to tamp efficiently below the horizontal diameter of the pipe.

Handling Pipe Safely and Economically

Handling of reinforced concrete pipe is very easy when properly understood. Even sections having a diameter of seven feet can be moved with comparative ease by gangs accustomed to this work.

The smaller sizes of pipe are usually loaded for shipment lying down, either crosswise or lengthwise of the car, while the larger sizes are shipped standing on end. Where a derrick car or locomotive crane is available for unloading, the chain sling has proved its value. When made of ⅝ or ¾ in. stock with a spreading bar made of an old rail, I-beam, or channel, it will lift and turn pipe without danger of slipping. The chain grips the concrete as it does the icy pavement when on a motor car wheel. Being equipped with grab hooks, it can be quickly adjusted to fit any diameter pipe, and disconnected as readily.

Concrete pipe can be made with a hole for lifting provided at the top in the center of gravity. With such a hole, pipe can be handled very readily without a sling. An eye-bolt is then inserted in the hole from above and a block of wood slipped over the bolt inside the pipe and held in place by a washer and nut. The hook on the lifting block of the crane is then inserted in the eye and the pipe swung off without any further adjustment.

When power equipment is not to be had, the work of unloading pipe from cars, trucks and wagons is more difficult. A block and tackle and skids are needed for

Shear Legs Will Be Found a Great Help

this work. Particular care should be used to see that stout skids are provided, down which the pipe can be rolled. Sufficient line should be at hand to carry the pipe down slowly, and it should not be disengaged until the

pipe is in a position where it will not roll. This eliminates the chance of damaged pipe from rolling or falling off of cars, striking stones, or colliding with other pipe.

Laying pipe on level ground requires very little lifting and frequently the tripod is the simplest and most effective means of handling. The only equipment needed in addition to the tripod is the ever useful chain block.

In laying pipe under old fills or under trestles with limited head room, chain blocks are very useful in lining

The Pipe Should Be Properly Bedded

up the sections of pipe. A dead man can be set on line with the pipe and the chain block attached to it. With the aid of pries, even 84-in. pipe has been set in this way. The K-hand power puller has been used to good advantage in this connection, as it offers a means of greatly increasing the pulling power of a man with a chain block.

When pipe is to be installed in a trench, gantrys save their cost even for short trenches, particularly if heavy pipe is to be handled. Hand crabs should form a part of any pipe laying gang's equipment and for trench work they can be used advantageously on the gantry.

General

One of the most important points to be observed in laying concrete culvert pipe is the proper grouting of the joints. If this is not done, leakage may cause percolation through the fill, which will affect the roadbed, or the leakage may seep under the pipe, undermining it so that it may fail in the resulting settlement. A 1-2 cement mortar should be used for grouting. Fortunately, this work is not difficult, particularly with bell and spigot joints, so that there is no excuse for not attending to it properly.

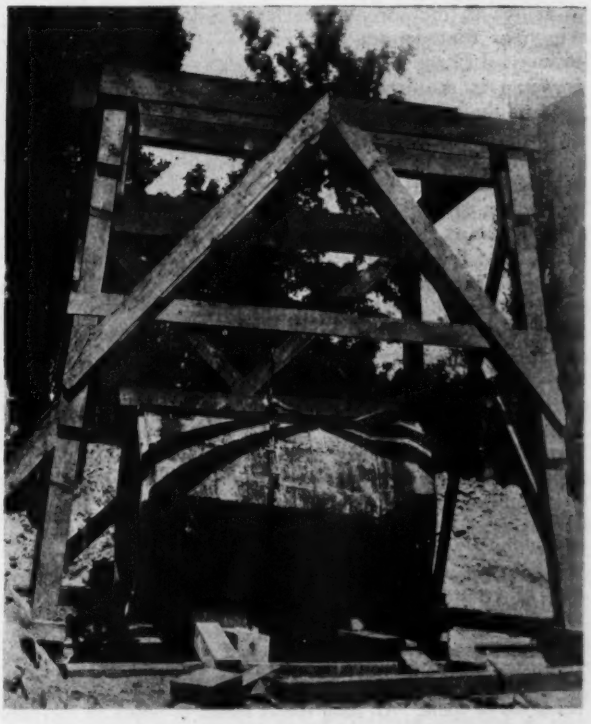
An easy way to make sure that strains caused by early settlement of the fill will not damage the pipe is to provide shoring inside the pipe. If such shoring can be left in place for several months the pressures on the top of the pipe are transmitted directly to the bottom, and the bending strains greatly relieved. This method of strengthening pipe temporarily is to be recommended wherever it is possible to obstruct the culvert partially in this way. It is by far the most efficient way of increasing the culvert's strength that has been devised.

In putting shoring in pipe, 8 in. by 8 in. or 10 in. by 10 in. timbers are used, depending on the size of the pipe. These should be cut to a length approximately equal to the length of the section of pipe, one line at the top and another at the bottom. Vertical struts of the same size are then cut two or three inches shorter than the distance between the stringers and wedged in place by wooden wedges at the top. While this partially obstructs the waterway, construction is usually done at a time when the spring freshets no longer produce floods that create danger by causing an overflow from clogging. It is frequently possible to leave this shoring in place until the following spring, when it can be removed in sufficient time to take care of the spring freshets.

Backfilling should never be done in a slipshod manner. In addition to the precautions as to tamping referred to above, the entire fill should be soaked at intervals if possible, to compact the entire mass. It is suggested that in filling from a trestle, dumping directly on the pipe should not be permitted until the fill over the pipe is at least 15 per cent of the total fill.

All pipe should be laid true to grade and as near as possible in the direction of the natural channel of the stream. Pipe which is oval in shape must be placed with the long diameter vertical. This is not difficult to insure through ordinary inspection which would be provided in work of this kind anyway.

Culvert pipe should either be extended so its ends reach at least to the toe of the slope of the fill, or else a head wall should be provided to protect both inlet and outlet. Many a fill has been made unsightly because this was not done, and many an end section of pipe has had to be relaid for the same reason. Rip rap at the outfall end is also useful, particularly where this is above the normal



Where the Large Culvert Is Long It May Pay to Put in a Gantry

level of the stream bed. It is best practice, however, to lay culverts with their bottom at least six inches below the former stream bed, allowing silt to fill in to this depth. Of course, there are times when limited headroom makes it necessary to lay the upper end of a culvert far below the

normal stream bed. In such cases, a box should be built to provide a break in the flow line and to prevent erosion.

The cost of laying concrete culvert pipe varies so much that it is hard to give even an approximate figure. The actual placing of the pipe has been accomplished for less than 10 per cent of the value of the pipe. In other instances, it has run as high as 30 per cent. The nature of the soil, amount of interruption to operatives, and the distance from the car or truck on which the pipe was hauled, largely influence these cost figures.

How the B. R. & P. Watches Switch Lamps

A DARK switch lamp is a serious menace to the movement of trains and the maintenance of way forces are taught to guard against this condition with extreme care. It is not always, however, that regulations for the care of switch lamps are formulated with as much care and executed with the systematic regularity that is observed on the Buffalo, Rochester & Pittsburgh. Therefore the following account of the methods pursued, together with the appended rules governing the care of switch and signal lamps, will be found a source of some excellent information on this subject. We are indebted for this to E. W. Hammond, engineer maintenance of way of the Buffalo, Rochester & Pittsburgh, Rochester, N. Y.

The track-walker on each section is held responsible for the proper care and maintenance of all switch lamps and slow board lamps on his section and he is required to report to the foreman each day after completing his trip over the section, every instance of a switch lamp failure. In case the cause of failure is not evident, the foreman is required to make an investigation and determine the cause, and if this is found to be due to neglect on the part of the track walker, discipline is applied.

Section foremen are required to mail to the roadmaster each day a report of switch light failures, using for this purpose a special form like the one illustrated. If no failure occurs, the foreman writes "No Failures" across the face of the card.

The information from these reports is tabulated in the roadmaster's office. The roadmasters are required to make a trip over the entire length of their respective divisions once every two weeks on night trains and note the condition of all switch and slow board lights, submitting a report in letter form to the division engineer after each trip. Through the transportation department, the maintenance forces also receive records of switch light failures reported by enginemen for checking against the reports made by track walkers and section foremen.

Rules for the Care of Switch Lamps

(1) All lamp founts used in connection with long time burners must be emptied once every month and refilled with new oil. The old oil thus removed must be poured into a can for that purpose and marked "Old Oil Only." When filled, this can must be delivered to the supply car in exchange for an empty can to be used for the same purpose.

(2) Lamp founts must not be filled higher than one-fourth inch below top of fount. All lamp founts should be wiped off carefully each day and once a month rinsed out twice with good clean headlight oil, and the oil used for this purpose poured into a can marked "Old Oil Only."

(3) Burners must be cleaned every two weeks by being placed in boiling water and boiled for 15 min. If ventilating holes are stopped up, use a fine wire to open them before boiling.

(4) The wick must reach the bottom of the fount and fit properly in the burner. If the wick does not work freely, it must be drawn up through the burner with the fingers and moved back to place by turning ratchet wheel. If the wick is still too thick, remove it and put in a new one that will fit and work freely in the burner. No wick is to be used longer than three months, and should be changed sooner if found dirty and retarding the flow of oil. A wick that will not move freely by turning the ratchet wheel is apt to clog, thereby preventing a free flow of oil to the flame. When the oil does not flow fast enough to feed the flame the burner overheats, a crust is formed on the wick and smoke is produced.

(5) Lamps must be thoroughly cleaned both inside and outside each day and special attention given to the cleaning of the top of lamp where soot is formed. The lenses must be wiped out each day with clean waste, and once each week lenses should be cleaned by wetting a piece of waste in water or head-light oil and then sprinkling on enough Tripoli to make a thin paste. With this the lenses should be thoroughly rubbed inside and out and the creases on the inside of lenses should be cleaned with a sharp pointed piece of wood. Particular attention should be given to the cleaning of these creases. A nail or other metal must *not* be used for this purpose, as it is liable to scratch the lens. After lenses have been well cleaned take a clean piece of waste, sprinkle on a small amount of Tripoli and rub lenses inside and out. This will give the lenses a good polish and assist in keeping them clean. Examine each lens carefully the last thing and see that the creases are all *clean* and that the entire lens is *perfectly* clean.

Buffalo, Rochester and Pittsburgh Railway

ENGINEERING DEPARTMENT

DAILY REPORT OF SWITCH LAMP FAILURES

Date ..... 19....

Section No. .....

..... **Division**

Station .....

Name and No. of Track .....

North or South Switch .....

Kind of Lamp .....

Date out ..... 19....

Cause of Failure .....

Reported by .....

Did Trackwalker report it? .....

When was lamp examined ..... 19....

By whom .....

Remarks .....

.....

The Foreman's Report Card

(6) The chimney must be cleaned each day, and no dirt or oil left on it. This is a very important matter and must be given proper attention. The chimneys can be cleaned in a similar manner to the lenses, with Tripoli, if necessary, once or twice a week.

(7) The wick must be kept below the top of the burner when the lamp is not lighted to prevent a flow of oil from the wick over the outside of the fount.

(8) Lamps must be lighted at least five minutes before turning the flame to the full height, and an examination must be made to see if the lamp smokes after the wick is adjusted.

(9) Sulphur must be burned off the match before lighting the wick to avoid encrusting the wick with sulphur.

(10) The burned portion of the wick must be pinched off each day, not cut off.

(11) All oil cans should be thoroughly rinsed out with two changes of clean oil before they are returned to the supply car, and the oil used for this purpose must be poured into a can marked "Old Oil Only." The outside of can should also be kept clean, and the cans should be kept with tops on. Section foremen should see that screw tops are furnished with the cans by the supply car, and that they are returned, and should notify the roadmaster when the tops are not furnished.

NOTE.—Special instructions will be issued when found necessary to clean lamps less frequently than once each day.

What Do You Do With Your Time After Six O'clock?

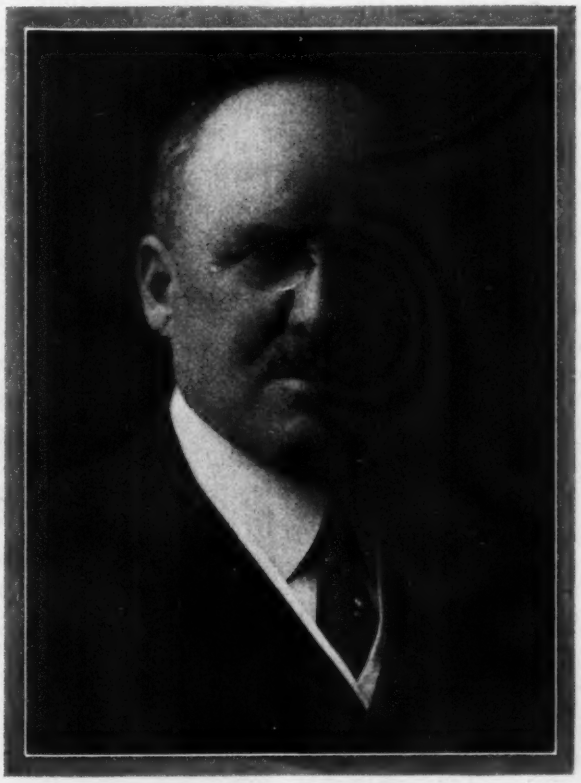
President Dice of the Reading Says That Study at Home Often Compensates for Lack of Special Training

BY WALTER S. LACHER

IN 1881, a young flagman while employed on railway construction in Pennsylvania got into the habit of going to the office in the evening, where his superior, the locating engineer, continued his labors until a late hour. As he was new at the work, there wasn't much that this young fellow of 18 could do in the office, but once in a while when the boss was especially busy and there were some figures to add up, he would be asked to help. The work thus assigned was done with such a willingness and with such an evident desire to learn to do more, that this sort of a thing got to be a habit.

It goes without saying that a man who formed habits such as these early in life did not long remain a flagman, and this was the case, for this young man was Agnew T. Dice, who is now the president of the Philadelphia & Reading, one of the principal anthracite coal roads and also one of the densest traffic, highest speed passenger lines in the country. In compliance with a request Mr. Dice told briefly of his early railway experience.

"My first railway job was with a locating party on the Pennsylvania," he said. "I got it without the benefit of either a college education or a pull. It was my ambition to get into the operating department, but I wanted to learn the fundamentals of location and construction first."



Agnew T. Dice
President, Philadelphia & Reading

"How did you manage to get into the operating department?"

"I didn't get into it for a long while, and when I did it was by a rather unusual route. I continued on location and construction work with the Pennsylvania for six years as a rodman, instrumentman and assistant engineer until in 1887, when I was assigned to some special work at Altoona, Pa. This consisted of a detailed study of block signaling and interlocking on the Pennsylvania Railroad. After I turned in my report I was made an assistant supervisor and two years later I was promoted to supervisor.

"About this time the management of the New York Central & Hudson River Railroad decided to install controlled manual block signals from New York City to Suspension Bridge on the Niagara River, and I was given the position of superintendent of signals to handle the installation of the block system. I took this position on January 1, 1892, and to handle the work effectively I found that I must make a thorough study of train operation and I suppose it was as a result of that that I was made assistant superintendent on the Hudson River division of the New York Central on January 1, 1893. I stayed in this position until April 1, 1894, when I became superintendent of the Atlantic City Railroad, which, as you know, is owned by the Philadelphia & Reading.

"I will not bother you with the rest of my story, as it is just a matter of gradual advancement through the operating department of the Reading until I was elected president in 1916. I think I can honestly say that I got my various promotions as a result of hard work and a disregard for hours. Others can do the same."

From the testimony of other members of the Reading organization, it is clear that Mr. Dice continues to observe rigid rules of industry.

"No man on the Reading," said Chas. H. Ewing, vice-president in charge of operation, "takes more active interest in what is going on than does Mr. Dice. For instance, he goes over the car loading reports with me every morning. Of course, the fact that he had a detailed personal experience as superintendent and general superintendent on the Reading himself gives him considerable advantage, because he is thoroughly familiar with the entire property, and, I might add, he continues to keep well informed as to all details."

The question of technical education for prospective railway officers is always a live one and was put to Mr. Dice.

"Of course, I felt some handicap because of the lack of technical education. By that I mean I had to work harder and put in more time at study evenings and on holidays, but a man will not necessarily advance any further because he has had the additional education. We try to get college men in the various departments of our road with the idea that their mental training will help

them to develop into valuable men. Some of them do well, others do not. On the other hand, we find that men are constantly coming to the top who did not have the advantage of any special training, other than what they got in their regular employment or from study at home."

"Do you think that a man who enters railway service now has as many opportunities as were afforded those who entered railway service when you did?"

"Yes, I think the opportunities were never greater than they are now."

"Is that due partly to greater attention which is now being paid to personnel matters on the railroads? By that I mean is there more chance for a good man to be found out because of the more systematic efforts being made to select the most promising material in the organization?"

"No, that is not the reason. In my opinion the value of personnel organizations is largely over-estimated. If a fellow wants to get ahead he must assert himself."

While this undoubtedly expresses Mr. Dice's candid opinion of the personnel work *per se*, he has always taken an interest in the personnel of the Reading as individuals. In this connection he has always fostered the Reading's veterans' association, which is an organization of many years' standing and comprises 1,500 men who have been in the service of the road for 25 years or more. Mr. Dice has a service record with the Reading by which he is himself entitled to membership and he takes an active part in its affairs. He knows a great many of the other members personally.

Mr. Dice has always taken an active part in negotiations with employees and has gained a reputation for absolute fairness. It is said that the employees' committees will frequently accept his verbal promises without written confirmation because they know that his word is good.

"The reason that there is more chance on the railroads now," he continued, "is because in these days too many young fellows are thinking more about the hours of service, Saturday afternoons, and vacations. Therefore, the young man who is really interested in his job and in the railroad does not have much trouble to get recognition. During the first 15 years that I was on the railroad my vacations were very few and far between."

"Don't you think that technical positions tend to narrow a man, to decrease his opportunity for developing executive ability?"

"That is not true of the usual construction or maintenance positions. The location of a piece of railroad is not an absolute thing to be determined by rigid mathematics. It is subject to modification and its determination is based on study and judgment. It, therefore, develops the man who must deal with it. The same thing is true of the ordinary maintenance of way problems, but is not the case with work that is primarily mathematical."

"Do you think that special knowledge or general mental ability is most essential in the selection of men for advancement?"

"This varies with different cases. It is almost invariably true, however, that when you want a man to advance to a position paying say from four to five thousand dollars per year, you have difficulty in finding any great number to select from. When it comes to higher salaried positions, qualified candidates are so scarce that the search for the right man is a real job."

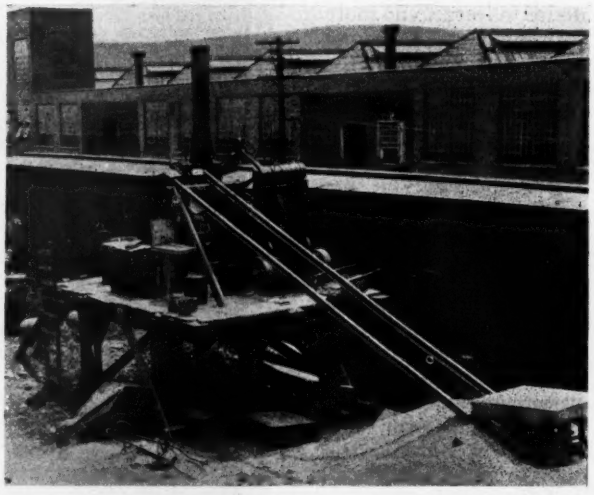
RESPONSIBILITY FOR FLOODS.—The Alabama Supreme Court holds that if a railroad culvert is sufficiently large to take care of a stream and becomes obstructed without the railroad's knowledge or fault, the company is not liable to land owners for damage by overflow.

Methods That Get Results in Bitumen Road Crossings

BY JOHN STANLEY CRANDELL
Consulting Engineer, General Tarvia Department, The Barrett Company, New York.

BECAUSE of the sustained interest manifested by maintenance of way officers in the bituminous bound road crossings, it seems well to outline some of the problems encountered in their construction and to detail the manner in which certain of the roads are carrying on this work. In an article appearing in the *Railway Maintenance Engineer* for April, 1922, the writer presented a specification covering the building of these tar bound crossings, and described in some detail how the work should and should not be done. This may well be amplified by some interesting developments brought to notice since that article was written.

It is, of course, natural that railway officers to whom the idea is new, should approach the problem from a conservative viewpoint, undertaking no extensive work and depending on the regular maintenance gangs for the necessary labor. However, on other lines where there is no longer any doubt concerning the merits of this construction, complete plans have been carried out for fitting up mixing plants, arranging storage and for teaching the men just how to do the work. Such roads are reaping benefits accordingly.



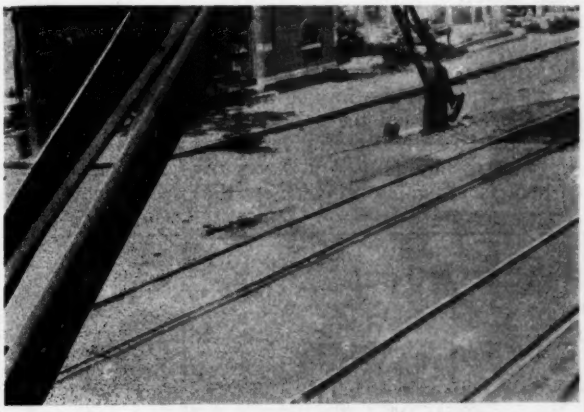
The Mix Prepared at a Central Plant Is Shipped to the Site in Cars Ready for Use

It will be recalled that the method described in the article mentioned above is that of mixing tar, stone and sand in the proportions of 16 gal. of tar to 1 cu. yd. of stone and sand, using sufficient sand to make a dense mix. The tar concrete so made is then allowed to cure for a week before it is used.

At Elmira, N. Y., the Erie has erected a mixing plant to do this work. As will be seen from Fig. 1, a substantial platform was built with the floor level somewhat higher than that of a box car. On this is placed a hoisting engine that not only hoists the skip from the stone pile, but also turns the mixer. When the mix is finished it is run down a chute into a box car, where it is kept until it has cured. The doors of the car are left *open* during the curing to assist in the evaporation of the solvent from the Tarvia KP, and to prevent the accumulation of gases

within the car from this evaporation. A week to 10 days is the usual curing period. Several box cars are used in this service and they are labelled "M. of W. Dept. for Mixing Tarvia."

When the mix in a car has cured, the car is sent to the crossing to be constructed and a sufficient amount of the mix is shoveled out. A small crew of trained men then quickly install the crossing. This method of box car storage has several advantages over other schemes. There

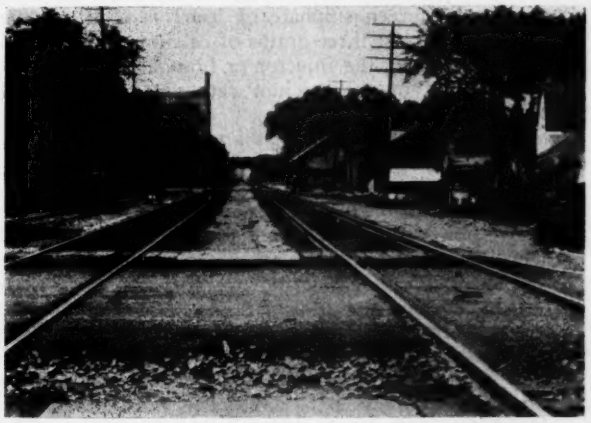


A Typical Tar Concrete Crossing

is no danger of rain spoiling the mix before it has had time to set up, soil cannot become mixed in as is the case where the pile is stored on the ground, and the mix is ready to be moved to any location at a moment's notice.

Figure 2 shows a typical crossing. It will be noted that there is a break in the surface along the rail on the far side of the picture. This resulted from the disturbance of the surface by the replacing of a broken rail the day before the picture was taken.

Complaint has been made that the tar concrete some-



Pumping Track Will Break Up the Surface Close to the Rail

times breaks down along the web of rail, as shown in Fig. 3. This will always occur where there is much vibration or movement of the rails. The Philadelphia & Reading is overcoming this defect successfully by putting in new ballast, new ties, and tie plates whenever one of these crossings is built. Vertical movement of the track is reduced to a minimum and there is no breaking up to the mix along the rails. If, however, the mix has broken away, the space should be filled with a thick mastic. This mastic should be poured or flushed into the empty spaces or where the mix has ravelled.

Bituminous pavements of all kinds need traffic to keep them in good conditions. When first constructed they should be thoroughly rolled. For crossing work a hand roller, such as a tennis court roller, is satisfactory, although a power roller is better. After the rolling is finished and traffic is admitted it may be noticed that the surface is marked by passing traffic. If the mix has been properly made this marking will do no harm, and in a short time the crossing will "iron out" smooth. The result when traffic is kept off a crossing for some time after it is completed is clearly shown in Fig. 4. In this case traffic was diverted for several weeks, due to a detour further up the road. A surface treatment with light tar will put this in excellent condition now that traffic has been restored.

Where all the mixing is done by hand it is sometimes customary to have four men turning the mix over, working two at a time. Various methods have been employed to spread the tar over the stone, but probably the most common is to use a sprinkling can, the spout of which has been hammered into a slit. A pail with holes punched through the bottom is sometimes used, but this is not so speedy as the watering can.

It is extremely important that the quantities be meas-

Lack of Traffic Will Cause the Surface to Deteriorate

ured accurately before mixing. An entire crossing may be ruined if a poorly proportioned mix is made. If too much tar is used the result will be a soft concrete that will never set up hard. If too much sand is used a wavy, rolling pavement will result. With some kinds of soft limestone sand may be omitted entirely. With harder stones, such as trap, granite and hard limestone, sand should be used unless a considerable quantity of small stone chips is present. What is desired is a dense, firm mix, and any proportioning of the ingredients that makes for maximum density should be striven for. Variation from the usual mix should be made if the character of the stone and the sand indicates that such a variation is desirable, but the first batch should be made in the proportions stated before.

Always make a lean mix rather than a rich one. It is a simple matter to give a surface treatment with tar to a lean mix already in place, but it is impossible to remove an excess of tar after the pavement is laid.

FIRE PREVENTION WEEK.—The week beginning October second has been set apart as a fire prevention week for the railroads of the country, during which all railroads are called upon to inspect all property for fire hazards, to make thorough inspections of all fire protection equipment, and especially to "clean up."

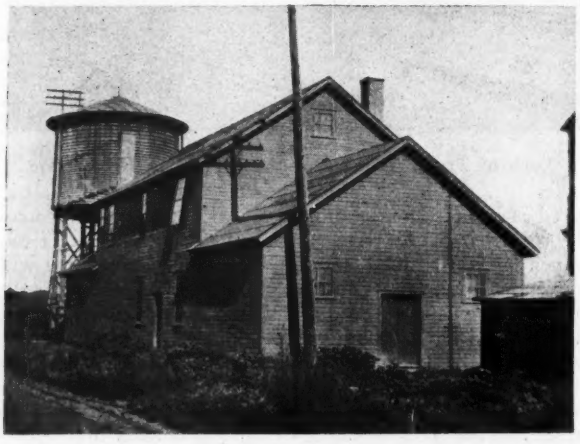
Extensive Water Treating Facilities Established on the St. Paul

Two Types of Construction Feature Fourteen Installations Recently Completed on This Road

By C. Herschel Koyl
Engineer Water Service, Chicago, Milwaukee & St. Paul, Chicago

HAVING decided that extensive water treatment was sorely needed in its bad water territory and if carried out intensively would greatly improve conditions there, the Chicago, Milwaukee & St. Paul inaugurated a program in 1920 under which about 400 miles of line, largely main line, was completely equipped with water-treating facilities. In all, fourteen treating plants were installed, one each (on the main lines) at Sanborn and Rock Valley, Iowa, and at Canton, Lennox, Marion Junction, Bridgewater, Vermilion, Yankton, Scotland and Ethan, S. D. and (on branch lines) at Tyndall, Avon and Platte, S. D. Treating plants having been installed previously at Sioux City, Iowa, and at Mitchell and Elk Point, S. D., this gave a total of 17 treating plants on the district, or a plant at every water station, except Plankinton, where the water is acceptable without treatment.

The new plants are continuous in operation and are of two types of construction. All of the main line plants with the exception of those at Lennox and Bridgewater are designed to treat 15,000 gal. of water per hour continuously and consist each of a hard water pump, a 40-minute reaction tank within which the mixture of hard water and the necessary chemicals (all fed in continuous streams) is stirred slowly by mechanical means; a three-hour settling tank; a treated water pump which delivers to the track tank, and a chemical storage room, all strongly housed and heated.

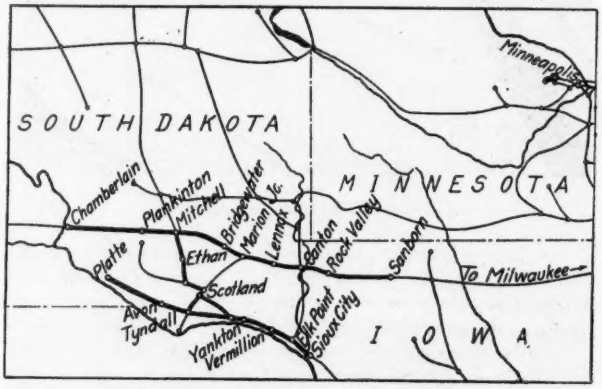


An Exterior View of the Plant at Canton, S. D., One of the Main Line Units

The Installation at Scotland Is One of the Larger Plants

The plant at Scotland, S. D., illustrated in the drawings, is typical of the main line plants. Everything is of wood except the machinery and pipe. The drilled well, 12 in. by 168 ft., under the pump room furnishes water to a double-stroke deep-well pump, which delivers it through a six-inch pipe to the water wheel which does the stirring. The water, after passing the wheel, flows to the bottom of the mixing tank, where, as it rises, it meets in succession the continuous streams of milk-of-lime, sodium carbonate and ferrous sulphate solutions.

Hydrated lime is used in water treating to extract the carbonic acid, which brings about the precipitation of the



A Map of the Treated Water District

scale-making limestone carbonates. Sodium carbonate (soda ash) is used to replace completely the scale-making limestone sulphates by non-scaling sodium sulphate. Ferrous sulphate (green sulphate of iron) is used for the treatment of the last three grains of calcium carbonate so that it will not clog the injector or branch pipe; this, by converting half of the calcium carbonate into calcium sulphate.

In these plants these reagents are all fed by regulated streams of water from the pipe which supplies the water wheel. The milk-of-lime box, holding 480 gal. of water, carries in suspension in each case enough hydrated lime for a five hours' supply (at Scotland 400 lb.) and this is fed continuously by a small stream of water entering at the bottom of the lime box and overflowing near the top through a two-inch pipe to near the bottom of the mixing tank. The drawing shows a lime pump at the top of the lime box, but it is there only for emergencies.

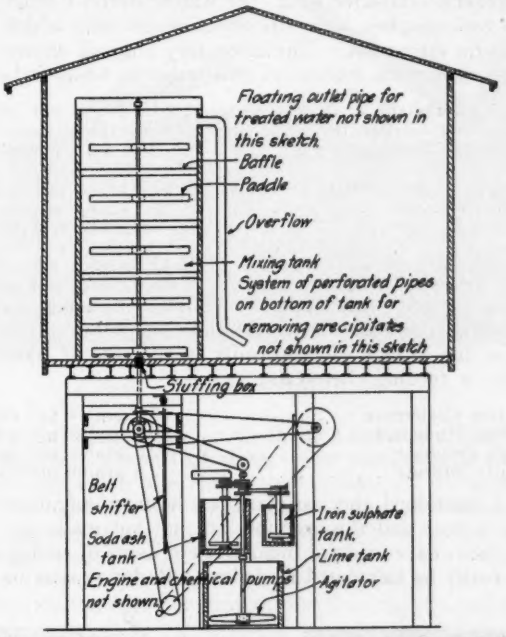
Once every hour an hour's supply of dry hydrated lime is added to the supply in the box. This method produces an hourly variation in the rate of lime feeding, but the stirring in the mixing tank is so thorough and so prolonged (45 min.) that only a slight variation is found in the water as it overflows from the top of the mixing tank to the bottom of the settling tank.

The dry soda ash rests on a shelf in the soda box and is fed to the mixing tank by a spray. The supply on the shelf is replenished hourly. The sulphate of iron is fed in solution from its box by a small stream which enters at the bottom and overflows near the top.

The best method of feeding any reagent to a treating plant is determined principally by its solubility in water and in all cases the thinner the solution or mixture the better. The arrangement of feeding devices described

above is not theoretically perfect, but has been adopted as the result of experience in handling railroad plants which are frequently miles from a repair shop and are seldom operated by skilled mechanics.

The water, with its chemical reactions practically complete and its precipitate ready to settle, arrives at the bottom of the settling tank and there commences to leave its precipitate as the water slowly rises to overflow through the perforated collecting pipe to the treated water pump in the pump room, whence it is sent to the track tank. The two pumps in the pump room are operated by a 10-



A Diagram Showing the Arrangement in the Branch Line Plants

hp. oil engine, each pump having a clutch on the engine shaft.

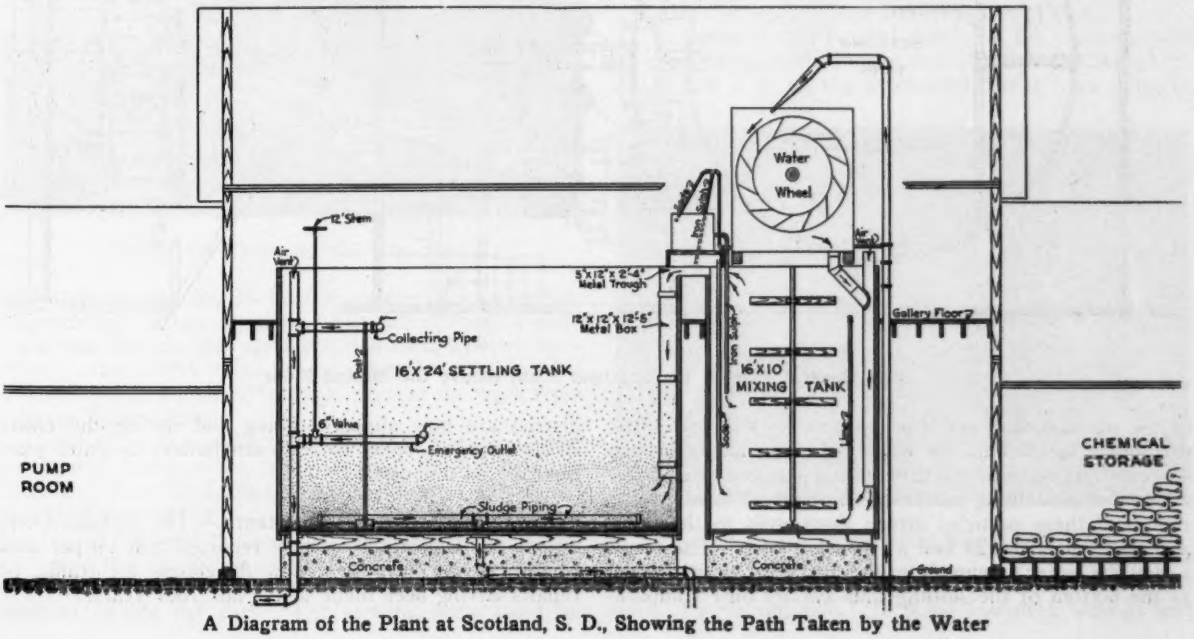
The settling tank is freed of its accumulated sludge once daily by opening for 30 seconds the valves controlling the system of perforated sludge pipes lying in the bottom of the settling tank. The perforations are in the bottom of the sludge pipes, and the branch pipes are connected to the main pipes by street-ells so that they are close to the floor. The pump room and working rooms are heated by hot water pipes along the walls. The chemical storage room is of 2½ cars capacity.

A Description of the Branch Line Plants

The plants at Lennox, Bridgewater, Avon, Tyndall and Platte differ from the other plants in that, being smaller stations, the existing roadside tanks are utilized as settling tanks as well as storage spaces for water to be drawn off by locomotives. One of the illustrations gives an exterior view of one of these plants and the diagram suggests the general arrangement of the interior. In the plant the mixing tank is built inside the roadside tank and a small engine is installed below the tank to furnish the power to operate three small pumps which discharge the chemicals, each from a separate vat, into the untreated water. This engine also furnishes power to drive the agitator in the mixing tank. Under this arrangement the untreated water enters at the bottom of the mixing tank, where it receives the chemicals and is stirred continuously as it rises to the top, flowing thence through an overflow pipe to the bottom of the settling compartment. Water for filling locomotive tanks is then obtained from the top of the settling space by a pipe, the receiving end of which is buoyed up by a float. The housing around the base of the tank is equipped with a stove for heating purposes and is made large enough to store the requisite supply of chemicals.

The Theory Governing the Design

In the plants built last year on the Chicago, Milwaukee & St. Paul, the advantage of the 40-min. mixing tank with its continuous but slow stirring is that the precipitate is all formed and ready to settle when the water enters the settling tank, and there is none left to form just below the top of the settling tank when it is too late to settle. Another feature of construction insures a character of precipitate which settles easily. When the chemicals first meet the water the rapidity of chemical action is so great that the particles of precipitate formed are very large and tend to settle quickly; but when the chemical work is nearly done and the few remaining molecules of carbon



A Diagram of the Plant at Scotland, S. D., Showing the Path Taken by the Water

dioxide meet the few remaining molecules of calcium oxide, the particles of precipitate formed are so small that millions of them make only a bluish cloud which will float for hours and is the bane of water intended for boilers, because precipitate suspended in the water of the boiler is the cause of the foaming attributed to many treated waters.

These small particles, at the moment of coming out of solution (commonly called the nascent state), have

The Installation at Lennox, S. D., One of the Branch Line Plants

great adhesive power and will attach themselves to any solid matter within adhesion distance. In the old way of feeding with a reaction tank at the top so that the flow was downward, the heavy precipitate had gone ahead and there was nothing for these last and very small particles to attach themselves to; but in the plants referred to, the hard water and the chemicals are introduced at the bottom of the reaction tank and flow upward, so that (since the precipitate lags behind the water) the reaction tank soon becomes and remains charged with a mass of precipitate to the full sustaining power of the upward flowing current, and these particles attach themselves to the older and larger particles as fast as they are born. The result is that the water flowing from the top of the reaction tank to the bottom of the settling tank carries only comparatively few and large particles which settle rapidly and leave the water free from haze.

The Plants Do Effective Work

The treating plants were built by company forces at an expenditure of approximately $18,000 for each of the larger plants and $7,000 for the smaller ones, and the last plant (the one at Scotland, S. D.) was set in operation on January, 1922. Since that time the boilers have been free from leaking, and almost free from foaming.

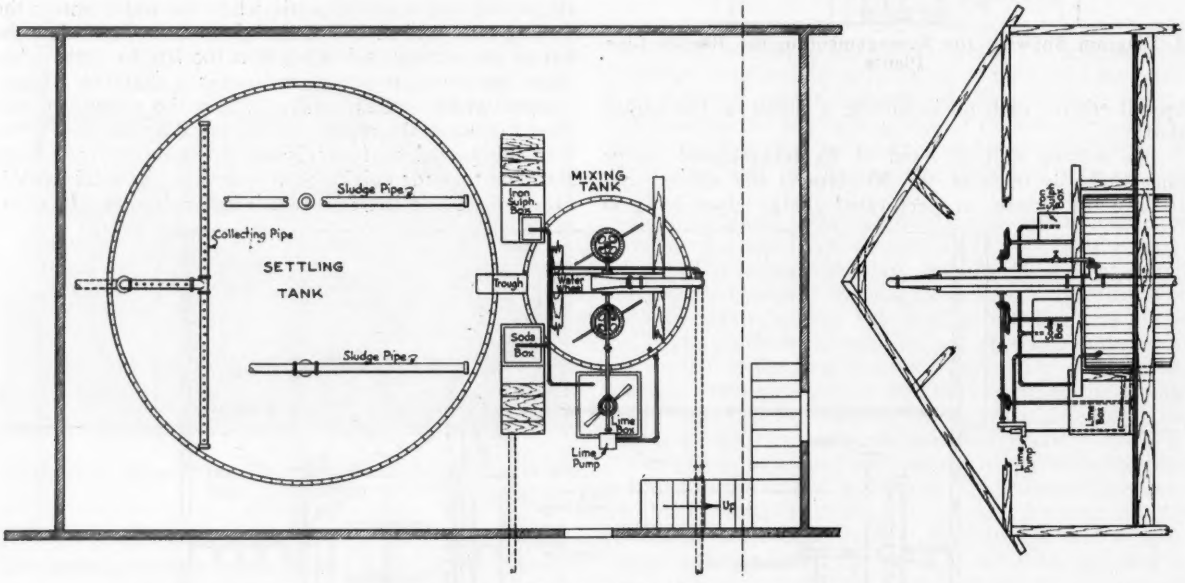
The results obtained at Scotland, where the water has the general character of all the waters derived from the deep well supplies, show the effectiveness with which the plants do their work. The laboratory analysis shows the dissolved mineral content of this water to be as follows:

Calcium Sulphate	64.9	grains per gallon
Magnesium Carbonate	10.0	grains per gallon
Magnesium Sulphate	11.8	grains per gallon
Total Incrusting Solids	95.7	grains per gallon
Alkali Sulphate	9.7	grains per gallon
Alkali Chloride	2.6	grains per gallon
Total Non-Incrusting Solids	12.3	grains per gallon
Total Dissolved Solids	108.0	grains per gallon

The treated water analysis follows, it being understood that there are daily variations up to one grain per gallon due to lack of uniformity in the rate of pumping water or feeding chemicals:

Calcium Carbonate	3.3	grains per gallon
Sodium Hydroxide	0.8	grains per gallon
Alkali Sulphate	92.0	grains per gallon
Alkali Chloride	2.6	grains per gallon

As mentioned, the last plant has been in operation less than a year and the accounts are not yet made up, but the plants have paid for themselves in items of saving that can easily be calculated in dollars. Boiler repairs on the district are now almost nothing and during the entire strike period no boiler troubles attributable to water were reported on this district.

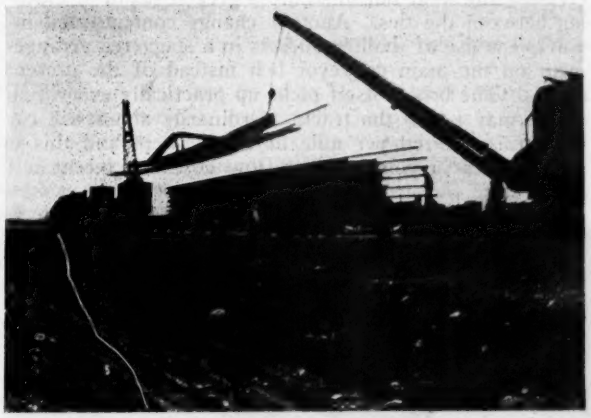


The General Plan of the Scotland Plant Above the Mixing Floor

RUSSIAN RAILWAYS DEPLORABLE.—The Russian Commissar for Education recently reported that 90 per cent of the railway lines were now dangerous for traffic, no repairs having been made in the last four years.

An Unusual Problem in Moving Railroad Track

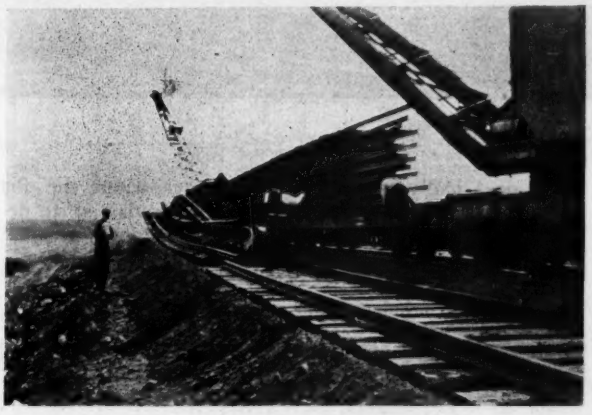
AN INTERESTING problem in track moving was presented recently on a western railroad when it was found necessary to take up 20 miles of second track



When Lifted

and place it on a new grade about 225 miles distant for similar track use at that point. The track was laid with 85-lb. rail and broken joints and because of the amount of it and the distance between the old and new locations, the problem was primarily one of performing the work as quickly and economically as possible.

In view of this it was decided to pick up the track bodily without further dismantling than to separate it in



Placing the Track on the New Grade

three-rail lengths and to load it on cars for immediate shipment to the new location. For this purpose a work train was drafted into service which included two locomotive cranes with three flat cars between them, and a timber truss or equalizer frame to prevent the track from sagging when lifting.

Preparatory to moving the track every third joint was disconnected, the spikes removed from the ties between them and these ties loaded on cars by hand. The operation then consisted of placing the truck or equalizer frame lengthwise between the rails of the section in question, fastening the rail to this frame by chains and then, with a crane operating at each end, hoisting the section to position on the flat cars. The sections were piled on top of each other until 11 had been loaded on each three-car unit, when these cars were set out and new cars loaded until 48 or 54 cars had been loaded in this manner. These cars were then assembled into a train and moved to the new location where the track was unloaded and laid in the same manner as it had been loaded.

Under this method of doing the work the two derricks, assisted by 12 laborers, removed the old track and laid it in the new position at the rate of from 1 to 1½ miles in ten hours. The entire operation was successful and the method afforded a marked saving in the work.

Cleaning Track With a Power Sweeper

ONE OF THE last forms of mechanical labor saving equipment for maintenance of way work is a power-driven track sweeper now in use on the Central region of the Pennsylvania Railroad. This unit sweeps up and loads into cars the dirt, chiefly ashes, cinders and coal dust, which fouls the track and ballast

The Track Before Sweeping

with extreme rapidity in the heavy traffic, mountain sections of the road where pusher locomotives are used regularly. An average speed of about four miles an hour is maintained and the track is well cleaned. Tests indicate that the cost is about one-half the normal cost.

The sweeper unit is used chiefly on the pusher grades of the Pennsylvania's main line through the Allegheny mountains, i. e., on the westbound tracks from Altoona,

The Track After Sweeping

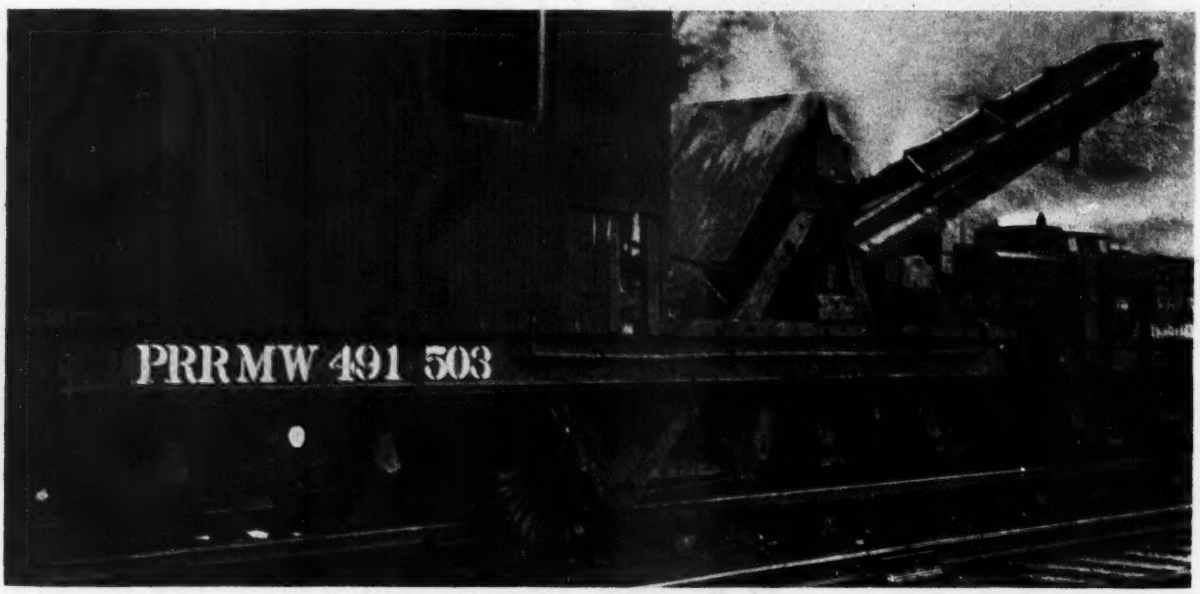
Pa., to Gallitzin and on the eastbound tracks from Johnstown, Pa. to Gallitzin. In some instances, sidings and

yard sections are also cleaned by this equipment. The dirt accumulates very quickly on this part of the line, there being about 102 miles of track which require cleaning from four to six times annually.

The sweeper consists fundamentally of a rotary steel broom 3 ft. in diameter and 7 ft. long built up from steel splints measuring 1-32 in. by 3-16 in. in cross-section. This broom is suspended beneath the frame of an old flat car by special hangers which permit it to be raised or lowered at will. This is accomplished through the use of an air brake cylinder connected with the train air line. The broom turns at about 100 r.p.m., and is chain driven from a gasoline engine mounted on the car deck. A steel pan hinged and shaped to fall over the two rails is attached slightly ahead of the rotary broom which sweeps the accumulations up this pan onto a conveyor belt 7 ft. wide. This belt operates over two rollers spaced 8 ft. 9 in. center to center and is chain driven. The dirt and ashes are retained on it by 2-in. angles riveted to the belt across the full width and spaced 1 ft. 8 in. from each other.

The debris which has been elevated by this belt is discharged into a hopper which in turn discharges it upon another conveyor belt mounted in an extension boom and running over rollers 24 ft. 2 in. center to center. This permits the final discharge of the accumulations at a convenient distance from one end of a hopper gondola or other type of open top car which is coupled next to the sweeper. The entire arrangement is housed over for protection from the weather and to secure maximum results in operation. The sweeper unit and car is handled by a locomotive, which can be one of the lightest engines in service as little power is required. The work is generally carried on under traffic and the best results are obtained after a light rain.

When the unit was constructed an obsolete flat car was procured which was somewhat narrower than the more modern cars. This limited the length of the broom to seven feet. The unit is thus able to sweep out towards the end of the tie for only about 6 to 8 in. from the rail. It does, however, do good work, removing deep accumulations easily and thoroughly. This can be seen in the photographs, where an accumulation of about three inches or more was removed down to or slightly below the top of the ties. All rail fastenings were uncovered and freed from contact with the dirt. The experience to date after about 50 miles of sweeping has shown that the broom wears but little, there having been only about 1½ in. wear for that amount of sweeping. Heavier splints are being considered, however, not only with the idea of decreasing the wear but to secure a greater depth of cleaning between the ties. Another change contemplated involves the use of shallow buckets in a staggered arrangement on the main conveyor belt instead of the present angles. The broom itself picks up practically everything which may be on the track. Ordinarily about one car of dirt is secured per mile of track swept and this is picked up at a comparatively low cost. A recent test made on a badly fouled section of track where the dirt was mixed with engine sand and well compacted, to determine the costs involved produced the following results:



The Ehrenfeld Track Sweeper

Cost When Using Sweeper

Engine service (including engine and train crews' time, fuel, oil, enginehouse expense and water) 8 hours @ $5.79	$46.32
Sweeper operator—8 hours @ $0.535	4.28
Laborers, three—8 hours—24 hours @ $0.40	9.60
Gasoline—9 gal. @ $0.29	2.61
Motor oil—1 gal. @ $0.72	.72
Total	$63.53
3,828 ft. of track cleaned and dirt disposed of. Cost per lin. ft.	$0.0167

Cost for Manual Labor

One foreman—9 hours @ $6.28	$ 5.62
14 laborers—9 hours, 126 hours @ $0.40	50.40
Total	$56.05
1,650 ft. of track cleaned and dirt disposed of. Cost per lin. ft.	$0.034

The new sweeper has been developed in the maintenance of way department of the Central region, W. D. Wiggins, chief engineer maintenance of way, and R. Faries, division engineer. The sweeper was designed and constructed by George Ehrenfeld, supervisor of track.

Promoting the Art of Making Good Concrete

A Practical Summary of Approved Practices as Determined by Exhaustive Investigation

By D. A. Tomlinson
Manager Railways Bureau, Portland Cement Association, Chicago

THIS is the first of a series of articles outlining the principles governing the making of good concrete, based on laboratory studies and experiments on investigations of practical work. The prime object is to express established principles in a form that will encourage definite application by the man directly responsible for the actual proportioning, mixing, placing and curing of the concrete.

Less Mixing Water Makes Stronger Concrete

Excess mixing water weakens concrete. Sloppy mixtures sacrifice strength. One pint more water than necessary in a one bag batch decreases the strength and resistance to wear of concrete as much as if two or three pounds of cement were left out. Concrete hardens because of chemical reactions between Portland cement and water. The quantity of mixing water is just as important as the quantity of cement.

The strength of concrete depends on the ratio between the volume of mixing water and the volume of cement $\left[\frac{W}{C}\right]$. As long as the mixture is workable, the smaller the water-cement ratio, the stronger the concrete. Thus decreasing the quantity of mixing water and increasing

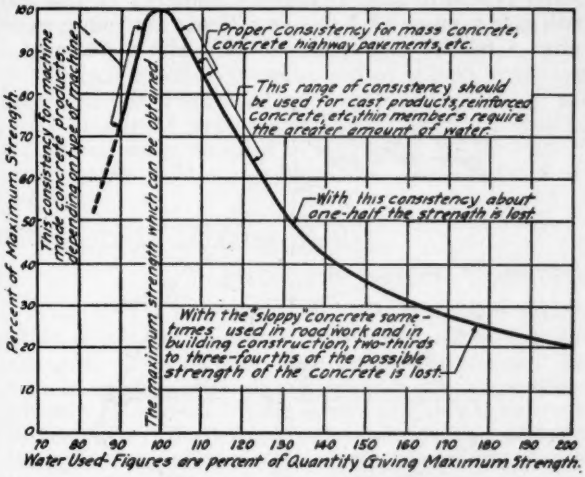

Percent of Maximum Strength
This consistency for machine made concrete products depending on type of machine
The maximum strength which can be obtained
Proper consistency for mass concrete, concrete highway pavements, etc.
This range of consistency should be used for cast products, reinforced concrete, etc., thin members require the greater amount of water.
With this consistency about one-half the strength is lost.
With the "sloppy" concrete sometimes used in road work and in building construction, two-thirds to three-fourths of the possible strength of the concrete is lost.
100
90
80
70
60
50
40
30
20
10
0
70 80 90 100 110 120 130 140 150 160 170 180 190 200
Water Used-Figures are percent of Quantity Giving Maximum Strength.

Fig. 1. Effect of Quantity of Mixing Water on the Compressive Strength of Concrete

In general construction the maximum strength can rarely be obtained, but it is possible to obtain 70 per cent to 90 per cent of the maximum strength without additional expense by resricting the quantity of mixing water.

the quantity of cement both add to the strength of concrete. With given proportions, the quantity of mixing water should obviously be reduced as far as possible and still obtain a plastic mixture.

Figure 1 shows the effect of the quantity of mixing water on the strength of concrete. It is an average of the results obtained with many mixtures and aggregates. The data on which it is based were secured from several thousand tests made at the Structural Materials Research Laboratory, Lewis Institute, Chicago. Mixtures on the right of the maximum strength line were plastic; mixtures on the left were not.

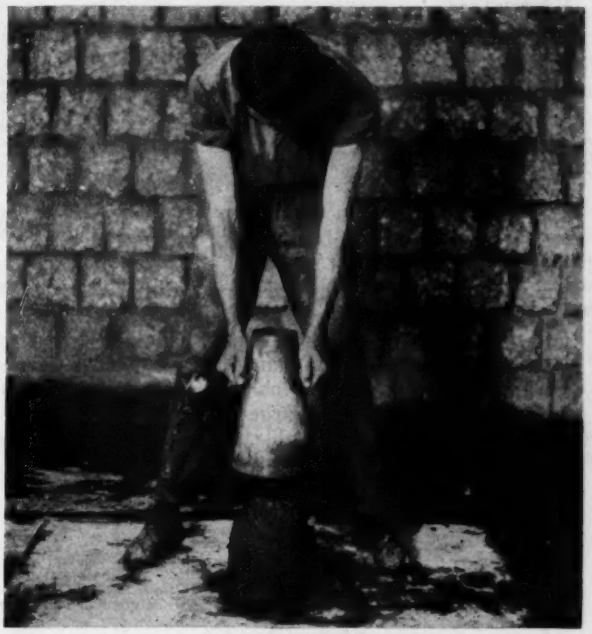


Fig. 2. Making the Slump Test. After the Mold Has Been Filled It Is Carefully Withdrawn. The Amount of Slump Indicates the Consistency

In general construction work, maximum strength can seldom be secured, because the mixture would be too stiff to be workable, but 70 per cent to 90 per cent of the maximum strength can readily be obtained. This would be a great increase over the usual results, since much of the concrete placed today contains 50 per cent to 100 per cent more water than necessary and thus attains only half or even only a quarter of its possible strength.

In the manufacture of concrete products, such as block and brick, the reverse is often true. Where the molds are removed at once, the mixture must be extremely stiff, and may contain too little water for maximum strength. Note the mixtures to the left of the maximum strength line in Fig. 1. In such cases stronger concrete would be secured with a more plastic mixture, which would require the molds to be left in place longer. That condition is never encountered in general con-

struction, where working conditions require plasticity. Therefore a safe rule for construction work is to use the smallest quantity of mixing water that will give a sufficiently plastic mixture for performing the work then under way.

Resistance to wear, which is vital in concrete pavements, floor and sidewalks, increases with compressive strength. Thus the smaller the quantity of mixing water the more wear-resistant will be the concrete being made.

Because of variations in the moisture content, absorption and grading of the aggregate, the exact amount of water that will be required for a given mixture and a given consistency cannot usually be specified in advance. The aggregate may contain enough water to reduce considerably the amount of mixing water necessary; fine sand or small pebbles require more mixing water than coarse sand or large pebbles. However, approximate quantities, applicable to usual conditions, are given in the following table.

Approximate Quantity of Mixing Water Required for Concrete

Mix		Appropriate Mix as Usually Expressed			Water Required (Gallons per Sack of Cement)	
			Aggregate			
Cement	Volume of Aggregate After Mixing	Cement	Fine	Coarse	Minimum	Maximum
1	3	1	1¼	2½	5	5½
1	4	1	1½	3	5½	6
1	4½	1	2	3	5¾	6¼
1	5	1	2	4	6	6½
1	6½	1	2½	5	7¼	7¾
1	7¾	1	3	6	8¼	8¾

Mixing water has two functions in concrete: First to hydrate the cement and second to produce a workable consistency. Rich mixtures require less mixing water per sack of cement than lean ones because the smaller volume of aggregate requires less mixing water to attain a given consistency.

Mixtures for reinforced concrete must usually be more plastic than for mass concrete or pavements. Therefore more mixing water is required, and loss of strength can be prevented only by using more cement. Obviously it is economy to limit the quantity of mixing water to the smallest possible amount.

The consistency to be used should be determined by the nature of the work. For mass work, sidewalks and pavements, the concrete can be fairly stiff. For reinforced concrete floors the consistency must be a little more plastic so that the concrete can be worked into place around the steel without difficulty. For thin reinforced concrete walls the mixture must be even more plastic. For all work, however, the consistency should be as stiff as possible. Very wet mixtures should never be used.

Consistency is easily measured and regulated by the "slump test." Through its use on the job, the quantity of mixing water used in the concrete can be controlled fairly closely. The only apparatus needed is a sheet-metal form, shaped like a frustum of a cone, 4 in. in diameter at the top, 8 in. at the bottom, and 12 in. high (see Fig. 2) and a ⅝-in. pointed metal rod 21 in. long. These can be made at small cost by any tin shop.

Fill this form with the concrete to be tested, placing it in layers about four inches deep, and working it with the pointed metal rod. In order to secure uniform results, specifications of the American Society for Testing Materials state that each layer should be rodded exactly 30 times. Lift off the form immediately and measure the slump of the concrete (see Fig 3).

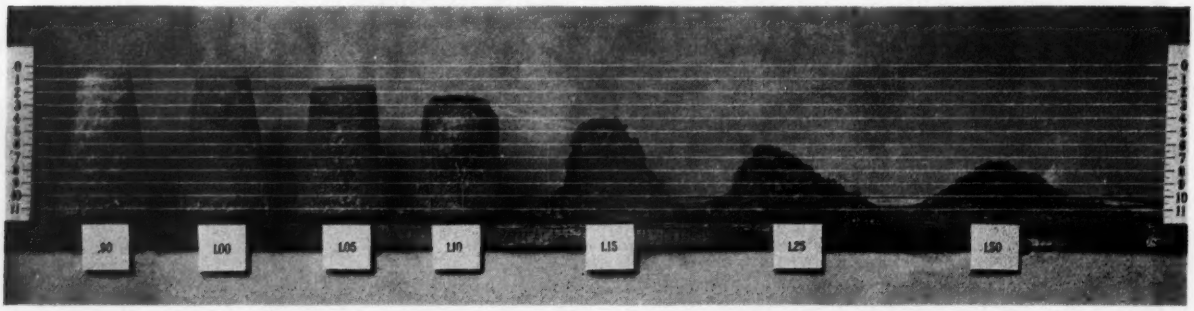


Fig. 3. Relation Between Consistency and Slump. The Tags on Each Pile Indicate the Relative Consistency of the Pile. The Scale at the Side Shows the Slump in Inches

Concrete having a slump of ½ in. to 1 in. will contain only a little more water than necessary for maximum strength, but will be too stiff for most construction work. Such concrete is said to have a relative consistency of 1.00. Concrete containing 10 per cent more water is said to have a relative consistency of 1.10 and will give a slump of 3 to 4 in.; 25 per cent more water gives a relative consistency of 1.25, with a slump of 6 to 7 in.; 50 per cent more water gives a relative consistency of 1.50, with a slump of 8 to 10 in. Figure 4 shows a typical relation between relative consistency and slump.

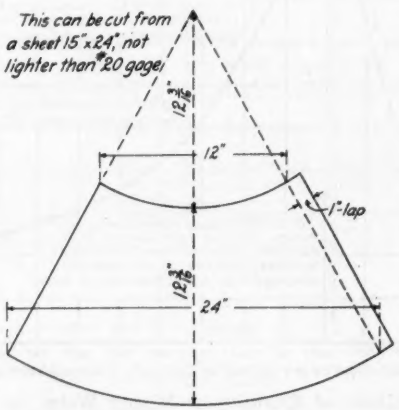


Fig. 4. Diagram for Cutting Metal to Make the Frustum of a Cone Used for the Slump Test

The progress report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete

(issued in June, 1921) recommends the following maximum slumps:

Type of Concrete	Maximum Slump
Mass concrete	2 inches
Reinforced concrete—	
Thin vertical sections	6 inches
Heavy sections	2 inches
Thin confined horizontal sections	8 inches
Roads and Pavements—	
Hand finished	4 inches
Machine finished	1 inch
Mortar for floor finish	2 inches

To apply the slump test in your work, estimate the minimum slump that you can use and still obtain the necessary consistency in the concrete. Test the batches frequently to check the slump and increase or decrease the quantity of water accordingly. A competent inspector or foreman can easily control the quantity of water, and therefore the strength of the resulting concrete.

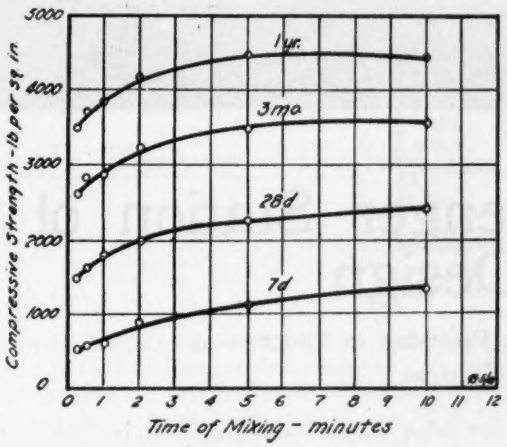


Fig. 5. Relation Between Time of Mixing and the Compressive Strength of Concrete

Remember that each excess pail of mixing water may decrease the strength of concrete as much as if two pails of cement had been left out. Keep the quantity of mixing water as small as practicable for the class of work under way. Use the same consistency in all batches.

Thorough Mixing Will Produce Better Concrete

Two batches a minute from a concrete mixer gives a rapid output but sacrifices considerable strength in the concrete. Two batches a minute usually means a net time of mixing, after all the materials are in the drum, of only 15 seconds. That is not enough for thorough mixing and will develop only part of the potential strength of the mixture. Moreover, concrete that has not been thoroughly mixed will not be uniform in quality; it is likely to contain stone pockets or voids which are weak spots and which may permit objectionable leakage.

Studies based on tests made at the Structural Materials Research Laboratory, Lewis Institute, Chicago, show that the time of mixing materially affects the strength of concrete. Typical values from these tests are shown in Fig. 5. Note the rapid increase in strength during the first 2 min.; note that concrete mixed 2 min. is 20 per cent to 35 per cent stronger than concrete mixed for only 15 sec. Note that mixing for 2 min. adds 500 to 700 lb. per sq. in. to the strength of concrete at all ages.

These same studies also show that thorough mixing makes much more uniform concrete. Specimens mixed for only 15 sec. showed a mean variation of 30 per cent in strength, while specimens mixed for 2 min. showed a variation of less than 10 per cent. Furthermore, thorough mixing gives increased plasticity. This means a more workable mixture and considerably less labor required in placing.

As shown in Fig. 6 changes in the speed of the mixer between 12 and 25 revolutions per minute have little effect on the strength of concrete. It is time of mixing, not speed of mixing, that insures strength and quality. Resistance to wear, so important in floors and pavements, increases with compressive strength. The increased strength and resistance to wear obtained by thorough mixing are decidedly worth while. If increased output is needed, don't speed up the mixer—use a larger mixer or get a second mixer.

Mixing the concrete for five minutes will give a still further increase in strength. Five minutes is, of course, longer than would be feasible on most construction work, but mixing for one to two minutes after all materials, including water, are in the mixer drum, is feasible and should be required.

When a mixer is speeded up, rapid output is temporarily secured. However, this spurt is usually followed by a period when the mixer is idle, because of delays in delivery of materials, completion of forms, or other causes. In most cases just as much concrete would be placed per day or per week with a longer time of mixing, and in addition to this, the concrete would be of much better quality.

The bridge engineer of one large railway system requires his bridge gangs to mix all concrete at least two minutes. At first some of the foremen objected to this rule as unnecessary and inefficient, but at the end of a year the foremen all agreed that not only had they placed better concrete than ever before but the concrete had been easier to handle and the total time required on each job had been reduced.

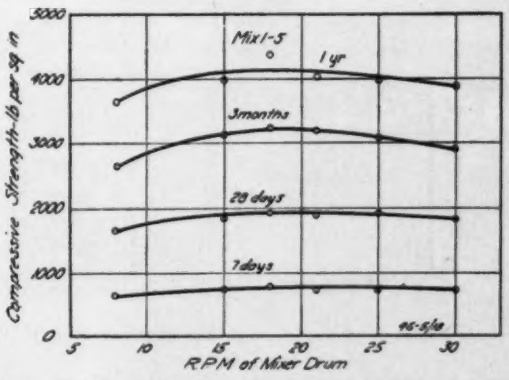


Fig. 6. Relation Between the Speed of Mixing and the Compressive Strength of Concrete

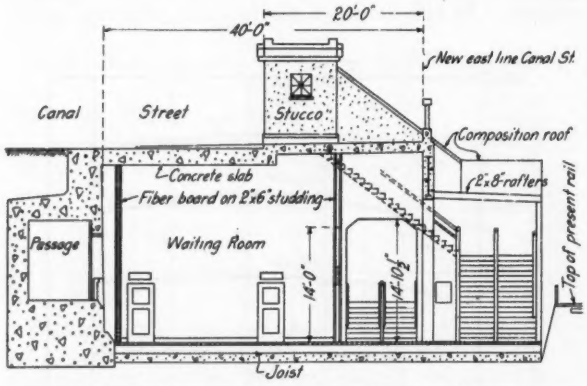
The Progress Report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete, issued in June, 1921, states: "The mixing of each batch shall continue not less than 1½ min. after all the materials are in the mixer." The general adoption of this rule would do much to improve the quality and strength of concrete being made at present.

A View of the Station From the Tracks

A Temporary Passenger Station of Unusual Design

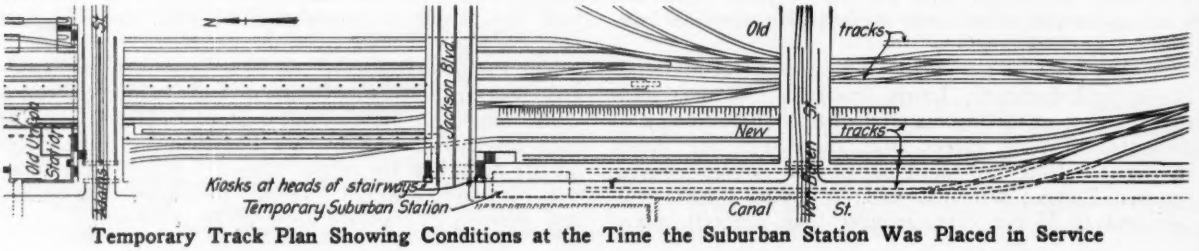
Facilities for Suburban Passengers Provided in Chicago at Relatively Small Expense

IN CONNECTION with the construction of the new Union Station at Chicago, a temporary station was provided for the suburban trains, which possesses many features of interest because of the manner in which convenient facilities were provided for a large number of passengers with the maximum use of portions of the permanent station structure and the ingenious adaptation of economical temporary construction. The building of the new Union station involves the entire reconstruction of the old track layout at a new elevation approximately five feet below the old track level. But, because the new track layout is considerably larger than the old one, it has been possible to construct a considerable part of five new station tracks at the south end of the station without disturbing more than a minor portion of the old tracks. However, further progress in the new track construction could not be made without tearing up some important tracks of the old station layout, and these could not well be spared unless some use was made of the newly completed tracks. A serious obstacle in the way of this expedient lay in the fact that the new tracks terminate a block south of the old station building, which would have made it hard to handle passengers to and from these tracks if it was not for the fact that the business of the station is naturally divided between through and suburban traffic. Therefore, by assigning these five tracks to the suburban trains of the Chicago, Burlington & Quincy, the Pennsylvania and the Chicago & Alton, which enter and leave the station from the south, and by providing suitable temporary station facilities convenient to these tracks, it would be possible to operate these five tracks virtually independent of the rest of the station.



A Cross Section Through the Waiting Room

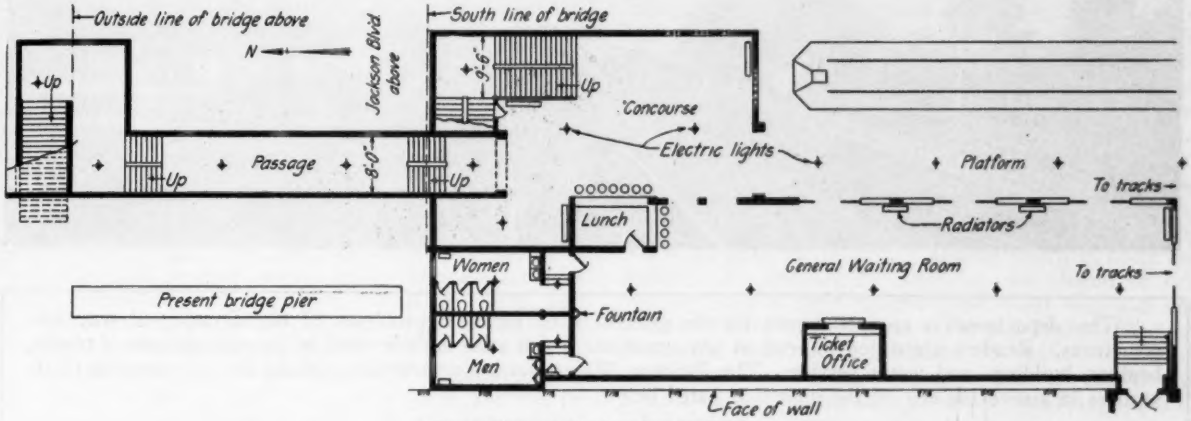
This plan was put into effect and has worked out satisfactorily. A temporary station provided at relatively small expense now serves over eighty trains daily and by providing a connection between the temporary and the old stations, occasional use is made of the suburban station by through trains. The estimated number of pas-



Temporary Track Plan Showing Conditions at the Time the Suburban Station Was Placed in Service

sengers using this station regularly each day is 12,000 in and 12,000 out.

The problem involved was to provide suitable temporary waiting room facilities at the new site, which is at the corner of Jackson boulevard and Canal street, until the concourse of the new station is ready for use. As this station will thus probably remain in service for only about two years, it was highly desirable that the construction involve a minimum expenditure, consistent with the comfort and convenience of the passengers. Fortunately, the passengers are practically all commuters, who pass directly from the street to the train or vice versa, so that the requirements are not nearly as severe as would be the case with a corresponding number of through passengers. No additional baggage facilities were necessary, as arrangements for trucking to and from the regular baggage room will serve for the small amount of baggage handled.

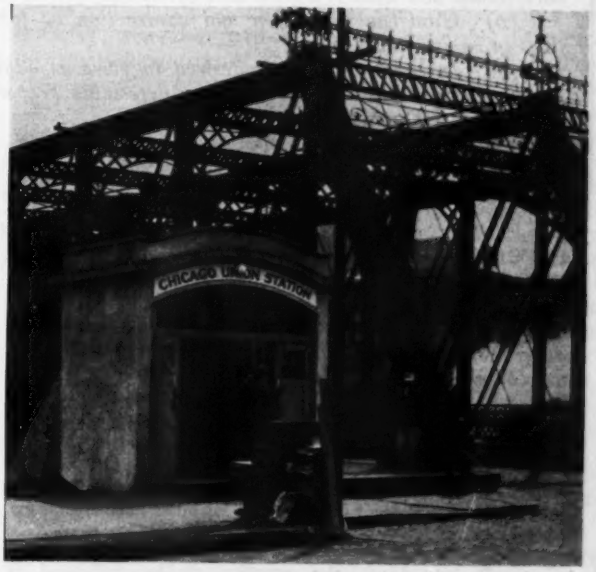


Floor Plan of the Station Building

The most important requirement was adequate stairways, together with a suitable concourse to afford ready communication from the ends of the track platforms to the street level, the tracks being depressed almost 24 ft. below the streets. This requirement was met by providing two stairways, one 8 ft. and the other 9 ft. 6 in. wide, on either side of Jackson boulevard along the east side of Canal street, thus allowing passengers to leave or enter the station without crossing the boulevard, which carries a very heavy automobile traffic during the two periods when the movement in and out of the station is heaviest. The floor plan of the station shows that the waiting room and auxiliary facilities have been placed outside of the direct line of travel between the trains and the stairs, because of the relatively small proportion of the passengers who make any use of these facilities. The waiting room is 27 ft. by 97 ft., with the toilet rooms, ticket office and lunch counter in convenient locations.

The expense of providing the temporary suburban station was reduced appreciably by the fact that the logical location for it was along the western edge of the station property where a west wall and a roof for a large part of the station were already provided in the form of construction work already completed for the new station. These comprise a retaining wall along the west edge of the station property which extends a distance of 40 ft. under Canal street, the street being carried over this area by a steel and concrete floor construction equipped with vaultlights in the sidewalk area. This floor construction was made to serve as a roof for a large portion of the temporary station, as will be noted on the plans. The track construction of the station, comprising a foundation consisting of a reinforced concrete slab, was also in place over a considerable portion of the temporary station area, and this greatly simplified the provision for the floor.

The portions of the temporary station building not forming a part of the permanent station are entirely of frame construction. All floors, except those in the toilet rooms, are of 2-in. plank laid on 2-in. by 8-in. joists, supported on the concrete track construction, and in a few places on mud sills. The walls consist of 2-in. by 6-in. studding, 16-in. center to center, covered with rock wall board on the interior, all joints being concealed by 2-in. by ¼-in. battens. Portions of the exterior exposed to the weather are covered with stucco laid on bishoprick board. The stairways are also of wood with strips of roofing felt, faced with pebbles to serve as anti-slip treads. The heads of the stairways on either side of Jackson boulevard are protected by entrance kiosks of ornamental design as indicated.

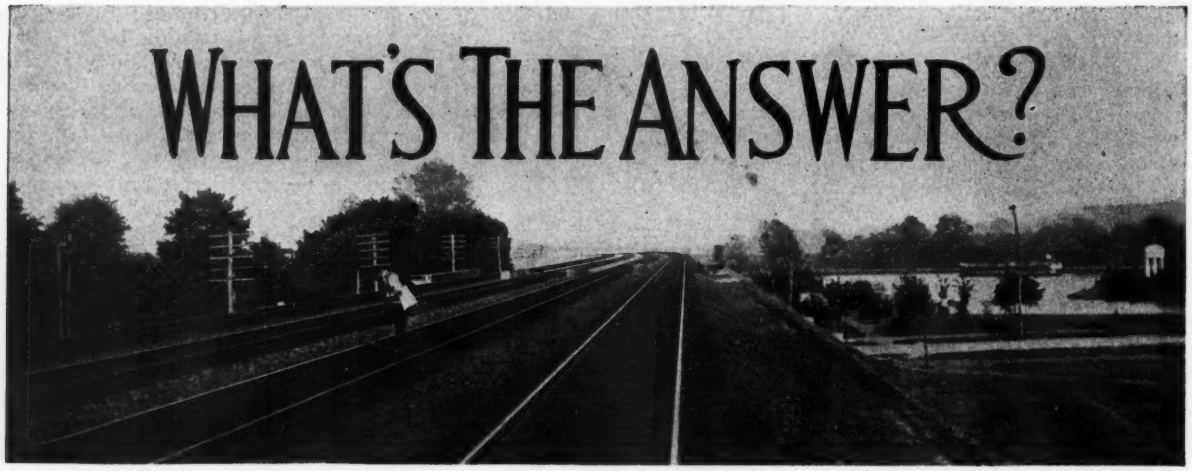


One of the Entrance Kiosks on the Street

In addition to the lighting afforded by the vaultlights mentioned above, windows have been provided in the south and east sides of the waiting room above the level of the doors, which also contain glass areas.

We are indebted for the above information to J. D'Esposito, chief engineer of the Chicago Union Station Company, and to Graham, Anderson, Probst & White, architects.

WHAT'S THE ANSWER?



This department is an open forum for the discussion of practical problems of maintenance of way and structures. Readers are urged to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. The *Railway Maintenance Engineer* also solicits the co-operation of its readers in answering any of the questions listed below.

The following questions will be answered in next month's issue:

(1) What precautions should be taken in stocking coal bins to protect the particular coal used from slaking and at the same time avoid spontaneous combustion?

(2) Is it good practice to use anti-creepers on bridges, especially those of some length?

(3) Is it injurious to health for one to handle cement or remain long in atmosphere of cement dust without using some sort of protector?

(4) Are hewn or sawed ties to be preferred? Why?

(5) To what extent should a newly-laid pipe line or a line subjected to extensive repairs be tested before back filling, and what is a good way of making such a test?

(6) How can expansion and contraction be taken care of best when installing hot water and steam lines in engine houses, etc.?

(7) In cases where it is desired to place an additional load upon the power unit, as by installing a larger or an additional pump, how may one determine preparatory to making the change just what additional load the power unit will stand?

(8) Is it advisable to allow boat spikes used on open deck trestles to protrude above the ties, considering the danger to pedestrians, and if so, why?

Preventing Corrosion in Heating Systems

To decrease or prevent corrosion, should hot water heating systems be emptied in summer or kept filled with water, or should the water be changed at intervals?

First Answer

Hot water systems in summer should be filled with a weak solution of soda ash to prevent corrosion.

P. M. La Bach,
Engineer Water Service, Chicago, Rock Island & Pacific, Chicago.

Second Answer

Generally speaking, the practice to be followed in handling the water of hot water heating plants is to empty the system whenever it is not to be used for several months and when in use to avoid changing the water. The explanation for this is found in the fact that while corrosion in pipe lines is the immediate result of the dissolving action of the water on the iron (which for a particular composition of iron proceeds slowly or rapidly, according to the electro-chemical influence of gases or salts in solution), continued progress of this corrosion depends on the supply of oxygen or some other substance capable of combining with the dissolved metal. Since oxygen is the usual substance met in ordinary waters, the problem is one of eliminating it, which may be accomplished, obviously, by reducing to a minimum the amount of fresh water entering the system. Since no corrosion can occur in the absence of moisture, the practical thing to do when the system is not used over a long period is to remove all the water, especially in cases where some corrosion does take place in spite of all precaution taken while the pipe lines are filled. On the other hand, if it can be seen that the pipes when emptied do not dry thoroughly, it may be more effective not to remove the water.

Pile Driving Rules

What is the best rule for determining the bearing power of piles?

Under masonry piers the supporting power should be figured according to the ordinary formulas or the piles should be driven to refusal. There are several formulas which pretend to give the supporting power of piles, but as far as I have gone none of these can be used without modifications.

As a general proposition piles must be driven to refusal; that is, until they refuse to drive more than ½ or ¾ in. per blow. Where the bottom is unusually soft and where the piles do not bring up on hard bottom the sup-

porting power should be figured from the skin friction of the pile or from some of the various formulas. In many cases one should be governed by the load the piles will carry, and the depth they should be driven should be based on experience with the bridge being replaced. These questions should be left very largely to the judgment of the general foreman on whose division the work is being done, as he is quite familiar with the bottom for all of his bridges.

It is not desirable that the piles shall be driven so hard that the head breaks under the hammer, neither should the driving stop when the pile is still going from 2 in. to 6 in. per blow. Cases have been found in which several bents were driven to ground level and topped with frame timber, only to give some trouble from settlement. In cases where especially soft bottom exists for a large depth it may even be necessary to run tests to tell how much load the pile will carry from skin friction alone.

Years ago, when repairing washouts east of our Missouri River bridge, piles were driven 85 ft. and 90 ft. and were still moving several inches at the least blow. Notwithstanding this large penetration the bents were loaded a few days after driving and no trouble from settlement has been encountered.

As a general proposition, therefore, dependence must be placed largely on records of penetration and the behavior of the piles originally built. On new lines dependence must be placed quite largely on the judgment of the construction engineer, general foreman and pile driver foreman.

A. F. ROBINSON,
Bridge Engineer, Atchison, Topeka & Santa Fe, Chicago.

The Proper Place for Rail Anchors

When applying rail anchors, should they be concentrated opposite the joints or distributed throughout the length of the rail?

First Answer

Rail anchors or anti-creepers should be applied throughout the rail and not concentrated opposite the joints. When they are concentrated opposite the joints and the rails are running in opposite directions they only help to skew the ties. Also when applied throughout the rail they have a greater effect in holding the rail.

G. E. STEWART,
Assistant Engineer, Southern Pacific, Stockton, Cal.

Second Answer

Rail anchors should be placed opposite each joint tie and at each quarter point. The anchors at the joints will prevent high waves occurring in the rail and will keep the joint ties in position, while the ones at each quarter will maintain the right expansion of each rail. With the anchors placed in this manner, track will remain in good condition in the worst of swampy places, providing bolts are kept tight at all times.

J. AZZUOLA.
Foreman, Canadian Pacific, Chapleau, Ont.

Third Answer

Separating myself entirely for the moment from any interest in the rail anchor question as a member of an organization which manufactures them and passing upon the question solely as one who has devoted a great deal of time to the study of rail creeping from an engineering standpoint and has observed the phenomenon under many different conditions, I am strongly of the belief that to obtain the most efficient results from rail anchors they should not be placed opposite the joints unless slewing of the joint ties would otherwise occur. In other words, if an adequate number of rail anchors are used per rail length to stop the creeping, then greater efficiency can be obtained from the anchors by placing them against intermediate ties in the panel than against joint ties. On the other hand, if an inadequate number are used to stop the creeping and if the joints are slot spiked, then anchors should be placed against the ends of the joint ties opposite the joints, as the keeping of the joint ties square and the prevention of tie slewing are the most important functions of a rail anchor.

The justification for this conclusion is quite obvious. Rail anchors should be placed where they will offer the greatest resistance to the creeping movement. This means that they must bear against ties which are securely seated in the ballast because the resistance of the ties measures the resistance to the creeping movement. Due to the extreme vibration at the joint, the joint tie is always the least securely seated tie in the panel. The ballast surrounding it is always disturbed more or less, depending on the amount of maintenance given it. Therefore, the joint tie offers the least resistance to the creeping thrust and is the most ineffective tie against which to place rail anchors. In applying the anchors, care should be employed to place them against good, solid ties, and one anchor should always be installed at each end of the same. On single track, anchors should be applied so that a single tie will resist the creeping in but one direction in order always to have a tight condition of ballast ahead of the tie when the anchors are placed.

F. A. PRESTON,
Vice-President and Sales Manager, P. & M. Company, Chicago.

Fourth Answer

The question evidently refers to track which is slot spiked at the joints. In this case, since creeping in track is seldom prevented, it may be necessary to use anchors opposite the joints to prevent slewing. But both from the standpoint of joint maintenance and of creeping, the track should not be anchored at the joints. Since the joint is the weakest part in the track (and this difference in strength is considerable in some track), why, then, make it still weaker by using those things on the joints that will only serve to disturb the foundation? It is a fact, as indicated by the wear on spikes at slotted joints and by the condition of the foundation, that stresses from creeping are often much greater than traffic stresses and good practice in recognizing this will avoid any attempt to prevent creeping by attaching track rigidly to the ties at the joints. The Chicago & Western Indiana is one of the pioneer roads in discarding the practice of spiking through slots at joints and has had no occasion since to alter its view concerning the wisdom of this plan.

E. D. SWIFT,
Engineer Maintenance of Way, Belt Railway of Chicago.

The Proper Protection of Fire Hose

What precautions should be taken to prevent the deterioration of fire hose attached to standpipes in buildings?

The proper precautions to be taken in protecting fire hose from deterioration depends largely upon the kind of hose used. Generally speaking, all fire hose used on railroads is divided into two kinds, linen hose and rubber-lined cotton hose, the use of the linen hose being confined to buildings in which the hose is not to be used for any other purpose than for fire and where the occasion for its use for fire is likely to occur only infrequently. It is entirely satisfactory to hang this hose up in folds and it is not necessary to change the position of the folds at intervals. But since the hose depreciates rapidly from contact with water, it should be dried thoroughly after using, kept in as dry a place as possible and its condition

inspected at intervals. Wherever it is intended to use a fire hose for other purposes, as in water stations or freight houses, only the rubber-lined cotton hose should be used, this hose being protected and cared for by keeping it on a reel when not in use, by thoroughly draining all water before rolling it up, and by passing water through it at intervals of about every three months.

FRANK HURD,
Superintendent of Fire Protection, Illinois Central, Chicago.

The Best Practice in Block Flooring

Should wood block floors be laid with a sand cushion or, if laid directly on a concrete base, is a layer of pitch or other adhesive material desirable?

Creosoted wood block floors should be laid on a solid foundation without a sand cushion between the blocks and the foundation. Concrete makes the best foundation for wood block floors and it should be finished smooth, exactly the depth of the block below and in conformity with the contour of the finished floor level. The concrete, after it has set and dried, should be given a thin, even coating of bitumen, applied hot, and this bitumen should be allowed to harden before the blocks are laid. The bitumen serves as a waterproofing of the under side of the blocks and also assists to bind the blocks to the base. The joints between the blocks should then be filled with a similar bitumen, applied hot with a rubber-edged squeegee after the blocks have been carefully driven tightly together and properly surfaced. This filling of the joints with bitumen is necessary to bind the units tightly together and also to prevent moisture, water, etc., from penetrating under the blocks.

When manufactured by modern machines the depth of the blocks is practically constant and when laid by competent pavers, on a properly finished concrete base, the surface of the floor will be as smooth as when the blocks are laid and rolled on a compressible cushion. Furthermore, this method assures freedom from depressions forming on account of the unequal compression of a cushion and the surface of the finished floor will improve constantly under traffic. Sand cushions have been responsible for the failure of many of the early installations of creosoted wood block floors through their tendency to shift under traffic and to pocket water under the blocks. Cement mortar cushions were later substituted for sand, but they were also open to criticism, due to their frequent failure to set up properly. The adoption of the above method of construction has now become almost universal and has been the means of the reduction in the depth of the blocks used.

LAMBERT T. ERICSON,
Chief Engineer, The Jennison-Wright Co., Toledo, Ohio.

Spot Surfacing of Track

What are the relative merits of "spot" surfacing of track as compared with the more thorough surfacing "out of face" at intervals of two or three years?

First Answer

Unless the surface of a stretch of track has become so irregular, or the ballast so extensively fouled that spot surfacing is out of the question (a condition which occurs only at long intervals), surfacing out of face should not be substituted for spot surfacing. The reason for this lies in the fact that once the tie has become thoroughly imbedded by the passing of traffic over it, it should be disturbed only in those cases where the surface or the condition of that tie itself is at fault. Of course, if satisfactory line and surface of track could not be obtained by spot surfacing, the answer would be different, but ordinarily proper lining and surfacing of track can be accomplished just as well as by surfacing out of face and often better, for the very obvious reason that in spot surfacing the work is directed to building up only the weakest spots which develop, while surfacing out of face, by raising the tie off the well-tamped foundation, will usually create a condition of ballast which will itself soon call for this same spot surfacing to overcome the weak spots which develop in it. In other words, when a tie once has found its bearing and the ballast around it is thoroughly tamped, why disturb it merely to make an adjustment in a piece of track two or three ties away?

E. D. SWIFT,
Engineer Maintenance of Way, Belt Railway of Chicago.

Safe Loads for Hemp Rope

What is the safe working load on the ordinary sizes of hemp rope of the grade commonly used on hoisting equipment?

By way of answering this question reference is made to Ketchum's Structural Engineer's Handbook, which contains the following information:

"Only the best new manila rope should be used for hoisting, as manila rope rapidly deteriorates when used and commercial manila rope varies greatly in strength.

STRENGTH OF THE BEST MANILA ROPE

Diameter	Ultimate Strength, lb.	Working Load for Derricks	
		Used Rope	New Rope
½	1,800	300	600
¾	4,000	670	1,340
⅞	5,400	900	1,800
1	7,200	1,200	2,400
1¼	11,200	1,870	3,740
1½	16,000	2,670	5,340
1¾	21,600	3,600	7,200
2	28,500	4,750	9,500

The Proper Size of the Air Chamber

How should the size of the air chamber for a pump be determined and what should be the relation between the height and diameter when made out of a piece of pipe?

First Answer

The size of a pump air chamber is based on the variation in pump pressures; that is, the difference between the maximum and minimum pressure. The single acting single cylinder pump produces the greatest variation, with the triplex double probably producing the least. When the conditions are static, the water will penetrate the air chamber a certain amount. The pump stroke will then produce pressures which compress the air.

There is no general rule, just as there is no general condition which will give the data necessary. The working out of special problems, however, suggests the following rules: For single acting pumps the air chamber should be from three to six times as large as the water displacement of the pump per revolution. For double acting pumps, this ratio should be from two to four times the water cylinder volume per revolution. The foregoing applies to air chambers placed on the pump itself. The farther you go from the pump the larger they should be and also the larger the entrance from the discharge line. I know of no rule applying to the latter case, but the logical thing to do when a piece of pipe is used for an air chamber is to make it larger in diameter than the discharge line, probably by not less than two inches.

P. M. LA BACH,
Engineer Water Service, Chicago, Rock Island & Pacific, Chicago.

A FURTHER ANSWER TO AN OLD QUESTION.

Adjusting the Speed of Pumps

With the required speed of the pump known, this multiplied by the gear ratio; that is, the number of cogs in the gear, divided by the number in the pinion, will give the speed of the pulley on the pump. With the speed of the prime mover known, this multiplied by the diameter of its pulley and divided by the speed of the pump pulley, gives the required diameter of the pump pulley to give the desired speed.

If this gives an impractical size and it is decided to change the size of the pulley on the prime mover instead, the diameter of this can be found by multiplying the speed of the pump pulley by the diameter of the same and dividing by the speed of the prime mover.

B. W. De Geer,
Water Service Engineer, Great Northern, St. Paul.

New Joints on Old Rails

New angle bars are not often recommended for use on old rails, yet they may be applied to advantage when the rail is in good condition and the old angle bars have become loose on account of muddy track, wear from loose bolts or from corrosion from gases, etc., in chemical districts. If the track is to be operated under heavy and fast traffic, new angle bars must be applied in order to secure proper track conditions. When new angle bars are installed, due care should be taken that the joint ties are in proper order. During the summer months, the joint should be lifted slightly and the joint ties well tamped. The same general plan should be followed in the winter months, the necessary lift being accomplished by means of shims. No loose ties should be left near the joint since any change of position of the rail by the passage of a train during the winter may cause it to break.

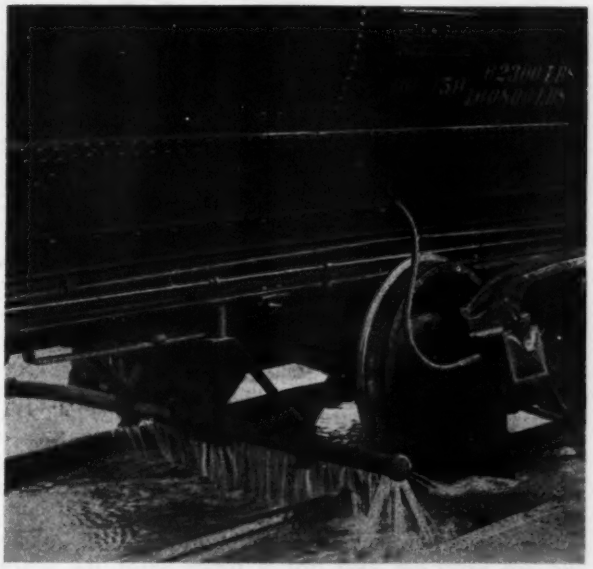
J. Azzuolo,
Section Foreman, Canadian Pacific, Chapleau, Ont., Canada.

Sprinkling Track for Passenger Trains

IN OPERATING trains through that portion of its territory which is largely desert, the Southern Pacific has constantly been confronted with a vexing problem owing to the presence on its right-of-way of fine sand which shifts over the track and rises in clouds during the passage of trains, to the great annoyance of passengers. The occasional application of oil to the track has not proved satisfactory owing to the continual tendency of fresh sand to blow upon the oil. In view of this, much interest attaches to a method of settling the dust at the time of the passing of each train.

The means by which this is accomplished is indicated by the illustration, the equipment used consisting essentially of a perforated pipe beneath the locomotive tender, a riser pipe connecting the sprinkler with the interior of the tank and a gate valve affording control from the engine cab. The sprinkler pipe is 8 ft. long and is hung about 10 in. above the rails to give adequate clearance. The pipe is 4 in. in diameter to secure a plentiful distribution of water when traveling at high speeds, but the precaution is taken in the design to establish the inlet end of the riser pipe some distance above the bottom of the tank to prevent the draining of the water supply through inadvertence or accident to the sprinkler system. The valve regulating the sprinkler supply is controlled by means of a pull rod extending from the front of the tender to a bell crank, one leg of which is connected to the stem of the valve.

The system was first placed on trial between Indio, Cal., and Palm Springs, since which it has been installed on four locomotives on each of these divisions. The result of these trials has shown the system to settle



The Sprinkler in Operation

the dust and cool the air. It is the intention eventually to equip all passenger engines in the sandy sections with these sprinklers.

We are indebted for this information to W. H. Whalen, division superintendent on the Southern Pacific at Los Angeles, Cal., who designed this device.

Defective Track Causes Derailment

IN an investigation conducted by the Bureau of Safety of the Interstate Commerce Commission in conjunction with the Public Utilities Commission of the state of Maine of an accident on the Bangor & Aroostook near Caribou, Me., on August 9, 1922, when a derailment of a work train resulted in the death of one employee and the injury of another, defective track was determined upon as the cause of the wreck. The accident occurred on tanget and practically level track over which the work train was backing up at a speed of approximately 15 miles an hour.

The section foreman said that he had noticed no rough spots and considered the track safe for any speed, and the roadmaster stated that while the track was not in perfect condition he considered it safe enough following the recent repairs to require nothing further in the way of ballasting until the general reballasting work which it had been planned to do in the near future. The section foreman admitted, however, that the track was in such a condition that it might settle. The testimony by the trainmen, principally that of the surviving fireman, established the conclusion that it was generally known that the track in this vicinity was rough for some time prior to the accident and an examination of the track for level and gage immediately following the accident disclosed the fact that while satisfactory in gage, the track was out level variously from ¼ in to 1¾ in. for a distance of 200 ft from the point of derailment, all of which pointed to the conclusion that the accident was the result of defective track and was immediately attributable to the delay in effecting its general reballasting.

Labor Board Will Soon Issue Decision on Maintenance Wages

ACCORDING to current understanding, the Railroad Labor Board was to have issued a decision on the maintenance of way case on Monday, September 25, but this proved to be an error and it is now expected that a decision will be announced some time during the first week in October. This decision will be received with a great deal of interest by both the employees and the companies by reason of the novel turn given to the hearing of this case before the Board because of the angle from which the employees' side was presented by the officers of the Brotherhood of Maintenance of Way Employees' and Railway Shop Laborers'. This was in the nature of a specific demand that the Labor Board recognize the living wage as a fundamental principle upon which any decision as to "just and reasonable" wages must be based and on this promise they submitted 48 cents an hour or a yearly wage of $1,175.04 as the minimum wage for section laborers. President Grable was supported by Jett Lauck in the capacity of consulting economist, who in justification for the demand for a ruling by the board, along the line proposed, said that it meant "that the board accept and make the basis of its decision in this case, as well as part of its general policy in fixing the wage of railway employees, that (a) adult workers of the lower grades, unskilled railway employees, be awarded rates of pay which will enable them, under normal conditions, to earn yearly an amount sufficient to permit them to maintain standards of living that are approved as healthful and decent and that are promotive of genuine industrial economy and efficiency; and (b) that proper differentials above this minimum living wage be paid for added skill, responsibility, training and hazard."

A large part of Mr. Lauck's supporting arguments dealt with an endeavor to construe the terms "just and reasonable," as applied to wages, to mean the "living wage" and that changes in the cost of living and other similar factors should not be taken into consideration until this "living wage" has been established in the railroad industry. He argued that the labor board had never followed the instruction given it in the law as he interpreted it and that the board, therefore, must now set to work to establish initial basic rates, "just and reasonable" wages, or the "living wage," the terms meaning the same thing, according to his interpretation.

The board declined to make any declaration with respect to this request, stating that it would neither limit nor enlarge the right of either party to present to the board its conception of what constitutes a just and reasonable wage within the meaning of the law. Following this decision of the board, Mr. Grable asked for a recess in order that he might make an appeal to Senator Cummins for the enactment of an amendment to the Transportation Act which would compel the board to recognize the principle of the living wage specifically.

The hearing was resumed later and after further testimony from the representatives of the employees, testimony was given in behalf of the companies. This consisted largely of statistics showing what the present average rate of wage is for various classes. This showed that the average rate for section laborers all over the country is 32.7 cents, while for the eastern roads it is 37.1 cents. The present average monthly wage for section foreman in the east is $147.58 or an increase of 107.4 per cent over the wage of 1915. The average wage for maintenance of way mechanics in the east is 62.1 cents per hour or an increase of 121.8 per cent over 1915.

Don't Want Overtime

In taking up the subject of primitive overtime after the ninth and tenth consecutive hours of work, a dispute involved in many of the submissions to the board, Mr. Grable cited the history of the overtime rules during the past four years, adding:

"We have no desire for any overtime, no matter what the rate. We do not care to work on Sundays and holidays and, if it were possible, or rather if it were practicable, we should be glad to have this board absolutely forbid all overtime and all work on Sundays and holidays. We realize, however, that an absolute prohibition of all overtime and Sunday work is impracticable, but it should be restricted to the very lowest minimum and it is for this purpose that we request the punitive rate of time and one-half."

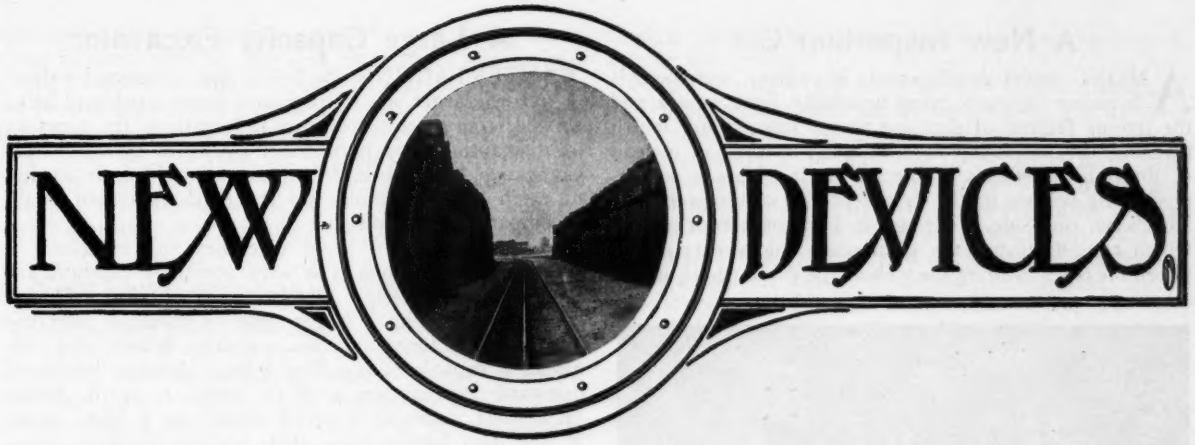
Mr. Grable contended that "when a railroad knows it can have the services of an employee at any time for an additional two hours beyond the eight hours of the basic day without paying more than the regular pro rata rate, the railroad will make absolutely no endeavor so to arrange the work as to obviate the necessity for the extra time.

The hearing was completed on September 1.

Shop Strike Quieter

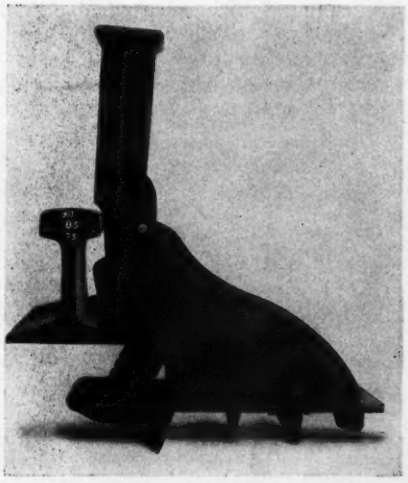
The shop strike is gradually assuming a place of minor importance—for two reasons—settlements under the Willard-Jewell agreement on the part of the employees and managements of a number of the roads in various parts of the country and the perfection of organizations of new employees on the part of a considerable number of the remaining roads. For the same reason the outcome of the drastic injunction ordered by Judge Wilkerson at the instigation of Attorney-General Daugherty is becoming a matter of decreasing importance insofar as it affects the railroads, notwithstanding the great interest that has been aroused because of the fine points of law involved. The injunction is most sweeping in its scope and prohibits a large number of specific acts on the part of the strikers that would discourage, interfere with or otherwise obstruct the operation of the railroads or the employment of men to take the place of the strikers.

The labor board handed down several decisions directed against the practice of contracting on various railroads on September 11 and subsequent days. These decisions, which involved the Erie, the New York Central, the San Antonio, Uvalde & Gulf, the Great Northern, the Chicago & North Western, the Cincinnati, Indianapolis & Western, the Chicago, Milwaukee & St. Paul and the Chicago Great Western, follow practically word for word the board's ruling in the Indiana Harbor Belt case described in the June issue, page 211. The practice complained of by the employees had been largely discontinued before or soon after the strike of shopmen began on July 1. At the board's inquiry on June 31 into the strike situation nearly all of the roads involved in these decisions announced the discontinuance of the practice of contracting or made a promise to do so as soon as possible.



A Device for Lining Track

A SUBSTITUTE for the ordinary lining bar is now being introduced by the American Steel Foundries, Chicago, which is designed not only to line track easier and more economically, but also to facilitate the lining of particularly heavy and complicated track structures.



The Track Liner Assembled

The device is essentially a jack and consists of three parts, a heel block, an adjustable ballast pin, which fits into the base of the heel block, and a lever, into the top of which an ordinary lining bar is insertel To operate, the jack is set up on the ballast so that the toe of the lever fits snugly against the rail to be moved. A lining bar is then inserted in the lever socket and pulled back, as one would pry upon any object, using a block or other support under the bar. This operation has the effect of pushing the rail directly forward without any of the lifting which takes place under the ordinary method, the design of the device being such that the jack, while in one position, will push the track 1½ in. horizontally without raising it. Two features operate to keep the jack from slipping under the load, one being the angle at which the lever bears down upon the heel block and the other being the lugs provided upon the base of the block. Of interest in this connection is the fact that the two lugs or ballast pins at the rear end of the heel block fit loosely in the base plate so as not to be in the way when setting up the jack and to permit of their being driven securely into the ballast before applying the load. The device weighs approximately 30 lb., and in addition to a handle for carrying, is provided with a buffer point on the lever for use when it is desired to apply the force to the end of the tie, as at a switch, instead of against the rail. Constructed in this manner it is claimed that the jack will adapt itself to any kind of ballast without necessitating any digging preparatory to moving the track.

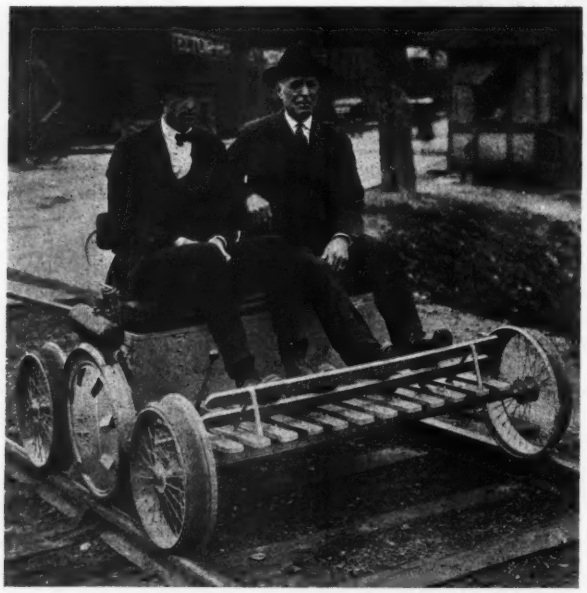
The device has been tried on several roads, among which are the New York Central, the Illinois Central, the Chicago, Burlington & Quincy, the Baltimore & Ohio, the Indiana Harbor Belt, the Michigan Central, the Chicago, Rock Island & Pacific and the Erie. Tests have indicated that on ordinary track lining three men equipped with jacks can perform the work ordinarily done by seven or more and that in heavy work, such as in lining frogs and switches, seven men equipped with the jacks can perform the work which in some cases could not be done with 25 or 30 equipped with lining bars.

Moving a Heavy Frog with Track Liners

In a test made on the Chicago Junction a crew of seven men equipped with these jacks are said to have lined three single switches and two interlaced switches successfully in 2 hours and 10 minutes under conditions which would have required a day and a half with 30 men using the ordinary lining bars. In another test on the Indiana Harbor Belt three men equipped with jacks are said to have lined 26 lengths of rail in straight track successfully in 1 hour and 10 minutes. The device is the invention of F. Hackman, under whom the tests are made.

A New Inspection Car

AMONG recent developments in railway equipment is a motor car embodying unusually light weight and the unique feature of deriving power from a unit which transmits its propelling force directly to the rail instead of through the wheels of the car itself. This is accomplished by bolting to the frame of the car between the wheels on one side, a Briggs & Stratton motor wheel, which consists principally of a small engine carried between the discs forming the web of the drive wheel, which



A Side View of the Teetor Railway Speed Car Showing the Power Wheel

discs transmit the force of the engine to the rail; a pneumatic tire forming the contact between the web of the power wheel and the track. The engine operates on gasoline contained in a tank carried on the mud guard and is equipped with a magneto to eliminate the necessity of carrying batteries.

The car itself has wire wheels with rubber treads, the treads serving to eliminate noise and assisting otherwise in adding to the comfort of traveling. These wheels are carried on axles securely imbedded in axletrees to which the floor is attached. The floor is made of hard wood slats reinforced by cross pieces. It carries a footboard and a large seat box equipped with seat cushion and a back rest, this seat box being large enough to contain the tools, accessories and other luggage of the passengers on the car.

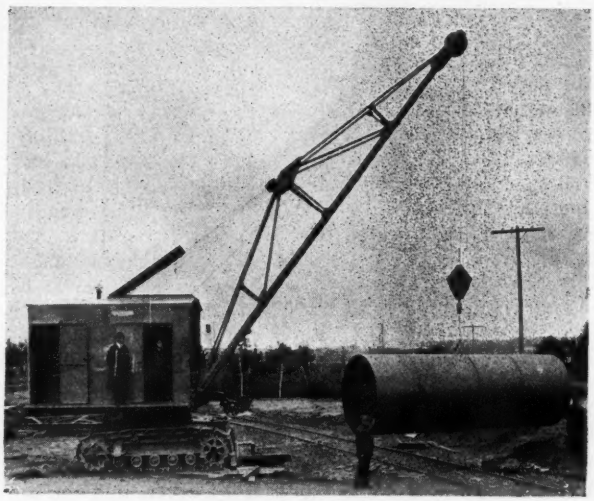
The car is designed for inspection purposes, weighs only 200 lb. and under average conditions will carry two passengers and their equipment at speeds up to 20 miles per hour. To stop the car it is not necessary to stop the motor, the operation consisting rather of raising the power wheel from the track by means of a small lever conveniently located at the right side of the car. To start the car, the motor is lowered until the tire of the wheel comes in contact with the rail, the car thereupon taking up the motion without jar. A brake acts upon both front wheels and when descending long grades the motor can be stopped and raised from the track, leaving the car at the will of the operator. The machine is called the Teetor Railway Speed Car and is a product of the Indiana Piston Ring Company, Hagerstown, Ind.

A Large Capacity Excavator

ENTERTAINING the belief that a demand existed for a larger size of excavator crane capable of being shifted from place to place on rails without the necessity of dismantling any part, the Pawling & Harnischfeger Company, Milwaukee, Wis., recently added to its line of earth handling equipment the machine shown in the accompanying illustration.

Similar to other P & H machines, this excavator is of the full revolving type with corduroy traction and with a general design permitting its operation by one man. Constituting a larger type of machine than had been manufactured by this company before, the new model is capable of handling a Page dragline bucket of one-yard capacity on a 35-ft. boom, a ¾-yd. bucket on a 40-ft. boom or a ½-yd. bucket on a 50-ft. boom. It will also handle clam shell buckets of from ½ to 1½-yd. capacities, depending upon the reach and the material handled. Aside from these uses, the machine is adapted to attachment to a shovel where light shovel work is required and can readily be used to operate a back-filling scraper, a crane hook or an electric magnet.

The corduroy tractions are of the self-cleaning type and are readily accessible for inspection and renewals. The ground bearing pressure of the machine equipped with this traction is about 10 lb. per sq. in. Each corduroy unit is equipped with independent gear drive and is otherwise designed to allow a high speed forward and reverse on both corduroys; a low speed forward, movement and reverse on both corduroys; a high speed forward and reverse on one corduroy and a low speed



The New P & H Excavator Under Test

forward and reverse on the other, and a high or low speed forward and reverse on one corduroy with the other corduroy running idle. All of these motions are controlled from the operator's platform regardless of the position of the revolving frame. The transmission gears themselves move on spline shafts, a construction which prevents the gears from sticking.

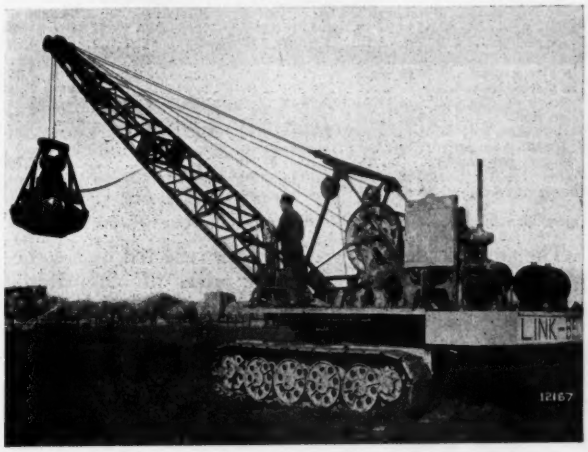
The source of power consists of a 75-hp. internal combustion engine, having a speed of 500 r.p.m. and a gear connection to the jack shaft. The power is transmitted to the jack shaft by outside band clutches and the drums are mounted on separate shafts, with the digging drum provided with machine-cut grooves. The boom is hoisted and lowered by means of a self-locking worm gear encased in oil, and the machine is completely enclosed by a sheet

When equipped with the standard boom and a drag-

line bucket it is particularly adapted for drainage work along railway right of way and for general excavation, a type of work for which the machines are being used at the present time on the Canadian Pacific. When equipped for use in loading and unloading coal in yards and in performing similar work the equipment consists of the standard boom and the clam shell bucket, and when equipped with the shovel boom the machine is said to afford unusual power for the rated capacity.

A New Development in Crawler Cranes

THE ILLUSTRATION affords a view of one of the more recent developments in crawler cranes with its housing removed to indicate what is claimed to be an unusually simple, compact and substantial construction. Contributing to this result as well as to its satisfactory performance are a number of features deserving of special attention, foremost among which perhaps is the fact



A New Link Belt Crawler Crane Showing the Power Mechanism and the Construction of the Underframe

that the machine is designed throughout exclusively for its operation by the internal combustion type engine, the principle being that the marked differences between steam and gas power require correspondingly different designs in the machinery to secure economy and reliability in operation. Of importance in this connection is the use of 24-in. band clutches, the kind and size of these clutches having been adopted to relieve the power unit of the character of shocks when engaging the drum, which are responsible for much of the trouble attributed to gas engines.

Another feature of special interest about the machine is the construction of the underframe, which consists of a solid steel casting to provide the desired rigidity necessary to meet the unusually severe service conditions to which crawler crane underframes are subject. Among other characteristics of the underframe is the unusually large size of the rollers, which are arranged in pairs on individual axles extending through the frame, this construction operating to keep the bearings out of the dirt and affording increased accessibility to the bearings and mechanism in the underframe. Other features of the underframe are (1) the use of treads which are self-cleaning and non-clogging, (2) the designing of each roller strong enough to carry the entire load that may be imposed on the underframe in order to avoid trouble when passing over ground not permitting of a wider distribution of the load, and (3) the suspending of the drive sprocket on axes above the level of the roller axle to afford easy passage over obstacles and to eliminate the need of using mats or other platforms when working in soft or wet ground.

Other features which serve more or less to distinguish this machine in its class are the automobile type of driving mechanism, the use of a silent drive chain to eliminate the noise common to such machinery when being propelled under its own power and the presence in the machine of only 16 gears, those in the lower frame running in oil baths enclosed in dust-proof casings. In this connection also may be mentioned the use of bronze bushed bearings and cut gears throughout the machine, and a type of gas engine which can readily be repaired and renewed because of its more or less standard design.

The machine without a bucket weighs approximately 22 tons, giving a ground pressure of 10 lb. per sq. in., with the size of caterpillar treads used. It will safely lift 10 tons at 12-ft. radius and three tons at a 30-ft. radius, while the hoisting speed is 125 ft. per min. with a maximum rope pull of 10,000 lb. on a single line. Having two independent hoisting drums the machine is suitable both for clam shell and drag line bucket work. It will rotate four complete revolutions per minute, travel ¾ of a mile per hour and climb a 20 per cent grade. In addition to this the machine is designed to permit its transportation over railroads without dismantling. It is known as the Link Belt crawler crane, and is a product of the Link Belt Company, Chicago.

A Novel Pipe Wrench

AMONG THE recent additions to the equipment of interest to maintenance forces is the pipe wrench shown in the illustration. This tool, called the "Little Giant" pipe wrench, is essentially a wrench of the type familiar in machinists' work which has been adapted to pipe fitting operations. It embodies a number of interesting features, one of which is the absence of springs, rivets, pins or other parts than a combined handle and jaw, a movable jaw and a steel adjusting notch. In the absence of springs and pivot joints, however, the wrench is said to present no deficiency in its ability to grip and release instantly at the option of the user.

Another feature of the wrench is the double set of teeth provided on the main jaw. Thus designed, the movable jaw can be engaged with either set of teeth, giving a correspondingly longer life to the tool. On the

The "Little Giant" Wrench in the 24-in. Size

larger sizes (a representation of which is illustrated) two additional sets of teeth are provided, making four in all, this design not only affording a longer life but also affording an advantage in certain classes of work by reason of the added number of positions in which the pipe may be gripped.

The wrench is being manufactured in 8-in., 10, 14, 18 and 24-in. sizes, of which the three smaller sizes are already on the market. As indicating its strength, the 14-in. size has repeatedly withstood stresses in excess of 4,700 in. lb. without slipping or bending, a strength which is 1,900 lb. in excess of the army and navy specifications for this size of wrench.

The tool is the product of the Greenfield Tap & Die Corporation, Greenfield, Mass., and has been found particularly useful in handling pipe in confined places.

Wood Preservers' Association

The Nominating Committee met in Chicago on September 21 and prepared a slate of officers for the ensuing year which will be submitted to the membership for letter ballot in the near future.

Roadmasters' Association

At a meeting of the Executive Committee in Chicago on September 3, it was decided to postpone the convention for two months, or until November 21-23, inclusive.

Bridge and Building Association

The following program has been prepared for the thirty-second annual convention which will be held at the Hotel Gibson, Cincinnati, on October 17-19.

Tuesday, October 17

Convention called to order 10:00 a. m.
Opening Business.
Report of Committee on Pile Driving Records.

Afternoon Session

Report of Committee on Labor Saving Devices in Routine Bridge and Building Work.
Report of Committee on Building Inspection and Records.
Report of Committee on Relative Merits of Wooden, Steel and Concrete Tanks.

Evening Session

Illustrated address on the flood control work of the Miami Conservancy District, by C. E. Paul, chief engineer, Miami Conservancy District.

Wednesday, October 18

Address by H. A. Worcester, vice-president, Cleveland, Cincinnati, Chicago & St. Louis.
Report of Committee on the Painting of Structural Steel.
Report of Committee on the Framing of Bridge Timbers Before Treatment.
Paper on the reconstruction of the Ohio River bridge of the Cincinnati Southern, by F. W. Henrici, assistant engineer of construction, American Bridge Company.

Wednesday Afternoon

Report of Committee on Handling and Driving Concrete Piles.
Inspection of new Cincinnati Southern bridge over Ohio River at Cincinnati.

Thursday, October 19

Report of Committee on the Construction and Maintenance of Sewers and Drains.
Closing business, including election of officers and selection of meeting place.

The annual dinner will be held on Wednesday evening. On Thursday afternoon an inspection trip has been arranged through the Cincinnati terminals. On Friday it is planned to make an inspection of the flood protection work of the Miami Conservancy District near Dayton.

Maintenance of Way Club of Chicago

Owing to a delay in the delivery of notices and extremely hot weather at the time, the meeting of the Maintenance of Way Club of Chicago, which was scheduled for September 6, was postponed until October 11. The election of officers and the presentation of a paper by F. W. Hillman on "Track Walking" have also been deferred until that time.

The Material Market

THE most important fact to be recorded in the market report for September, 1922, is the advance in the base price for open-hearth rails from $40 per ton to $43, announced on September 15 as effective for all orders placed after October 1. The proviso in the announcement that orders would be accepted on the old price until the first of the month for rails to be delivered in the early part of 1923 is resulting in the placing of a large number of orders supplementing those which were noted early in September when the first of the railroads entered the rail market. A comparison of the quotations on steel items for August and September, recorded below, shows even more marked advances in price than were apparent during the previous thirty days. The upward trend is particularly pronounced in the case of structural material which is now approaching 2½ cents per lb. for early delivery.

	Prices Per 100 Pounds			
	August 20		September 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2.35 to $2.50	$2.50 to $2.75	.... $2.75	$2.75 to $3.00
Track bolts	3.25 to 3.50	3.60 to 3.75	$3.75 to 4.00	3.75 to 4.00
Angle bars	.... 2.40	.... 2.40	....	....
Tie plates, steel	2.00 to 2.25	.... 2.00	.... 2.25	2.15 to 2.25
Tie plates, iron	....	.... 2.00	....	2.15 to 2.25
Plain wire	2.25 to 2.35	2.59 to 2.69	2.35 to 2.50	2.69 to 2.84
Wire nails	2.40 to 2.60	2.74 to 2.94	2.60 to 2.75	2.94 to 3.09
Barbed wire, gal.	3.05 to 3.15	3.39 to 3.49	3.15 to 3.40	3.49 to 3.74
C. I. pipe, 6 in. or larger, per ton	....	.... 47.20	....	.... 48.20
Plates	1.80 to 2.00	1.90 to 2.00	2.00 to 2.25	2.10 to 2.34
Shapes	1.80 to 2.00	1.90 to 2.00	2.00 to 2.25	2.10 to 2.34
Bars	1.80 to 2.00	.... 2.00	2.00 to 2.25	2.25 to 2.50

Open hearth rails, f. o. b. mill per gross ton after October 1, $43.00.

The advances in new materials are reflected by a somewhat lesser upward trend in the prices of old material and scrap, as indicated in the table below.

	Prices Per Gross Ton at Chicago	
	August	September
Relaying rails	$22.50 to $27.50	$27.50 to $32.50
Rerolling rails	19.00 to 19.50	19.50 to 20.00
Rails less than 3 ft. long	18.50 to 19.00	21.50 to 22.00
Frogs and switches cut apart	15.75 to 16.25	18.50 to 19.00
	Per Net Ton	
No. 1 railroad wrought	14.50 to 15.00	18.00 to 18.50
Steel angle bars	15.00 to 15.50	18.50 to 19.00

An examination of the table below shows that the prices for lumber are still advancing. However, a change is taking place in the lumber market which will tend to counteract this condition, namely, that there is a falling off in orders as a result of which the production has exceeded the demand for several weeks. This is a consequence of the normal seasonal cessation of work accentuated perhaps by the retarding effect of the current labor troubles and the present high cost of building.

Southern Mill Prices

	August	September
Flooring, 1x4, B and B, flat	$45.55	$49.95
Boards, 1x8, 14 and 16, No. 1	38.90	....
Dimension, 2x4, 16, No. 1	27.10	29.70
Dimension, 2x10, 16, No. 1, common	27.30	32.15
Timbers, 4x4 to 8x8, No. 1	24.85	25.15
Timbers, 3x12 to 12x12, No. 1	31.45	33.50

Douglas Fir Mill Prices

Flooring, 1x4, No. 2, clear, flat	37.00	41.00
Boards, 1x6, 6 to 20, No. 1, common	14.00	14.00
Dimension, 2x4, 16, No. 1, common	18.50	20.50
Dimension, 2x10, 16, No. 1, common	17.50	21.50
Timbers, 6x6 to 8x8, No. 1, common	17.00	17.00
Timbers, 10x10 to 12x12, rough	17.00	18.00

The shortage of coal has seriously affected the production of cement and some construction operations have been retarded by slow deliveries. One large railroad was recently forced to take bulk cement to avoid suspending important construction work. This shortage has been reflected in an increase in the price of Portland cement, effective August 30, which ranges from 10 to 15 cents per barrel. Current prices in carload lots, not including package, are given below:

Chicago	$2.20	Duluth	$2.14
Cincinnati	2.59	Milwaukee	2.37
Davenport	2.43	Minneapolis	2.39
Detroit	2.48	Pittsburgh	2.24

The News of the Month

The Missouri, Kansas & Texas now has a contract in process with electric power interests, which if consummated will furnish electric passenger service between Dallas and Denton, Tex., a distance of 48 miles. It is proposed that the electrical interests shall lease trackage rights and that electrification of the line will in no way interfere with the operation of freight trains or through passenger trains.

The Railroads in Northern Minnesota having suffered serious losses in damages sustained on account of forest fires have been taking unusual precautions to prevent the reoccurrence of fire, prominent among which is the practice on the Duluth, Missabe & Northern of patrolling the track with hand speeders and sending out a fire train to extinguish fires beyond control with the equipment carried by the patrolman.

William A. Webb, formerly general manager of the Missouri, Kansas & Texas and since May 10, 1921, president of the Cambria & Indiana, with headquarters at Philadelphia, has been appointed chief commissioner of the State Railways of South Australia, comprising 2,333 miles of line of which 1,124 has a 5 ft. 3 in. gage. This appointment constitutes one of several instances in which foreign railways have selected managers from the United States.

The American Railway Engineering Association has issued a bulletin of 100 pages containing building specifications which have been in progress of preparation for the last few years by the Committee on Buildings. These specifications will be submitted for approval at the next annual meeting of the association in March, 1923, and are being issued at this time to afford opportunity to the committee to receive suggestions and criticisms which it solicits from all readers. The specifications are published in A. R. E. A. Bulletin No. 247.

In a report prepared by the Bureau of Safety of the Interstate Commerce Commission on an accident which occurred on the Southern near Middletown, Tenn., on June 7, when a freight train traveling at 25 miles an hour was derailed by a washout, killing the fireman, it was brought out that while the section foreman had not been notified by the dispatcher of the heavy rain causing the washout, which began after the track foreman had retired for the night, the waterways in the vicinity were clogged and the drainage of the road had, generally, showed neglect.

British Columbia has been advised to scrap its railways in a report made for the Provincial Government by J. C. Sullivan, consulting engineer and formerly chief engineer of the Canadian Pacific Western Lines. This report states in part that "unless the people of British Columbia are prepared to continue paying from two million to two and a half million dollars a year for ten years on the investment already made in the Pacific Great Eastern Railway, the whole system should be abandoned." Mr. Sullivan strongly advises against extension of the line and urges abandonment of the section from Quesnel (the present northern terminus, 360 miles from Vancouver) to Prince George. He also recommends abandonment of the line from Squamish to Clinton, 166 miles, and using the salvage money to build a line from Clinton to Ashcroft.

D. B. Steinman, consulting engineer and professor in charge of civil and mechanical engineering, College of the City of New York, recently presented a paper before the regular meeting of the American Society of Civil Engineers on September 6, entitled "Locomotive Loadings for Railway Bridges," in which he described a system of loading claimed to be superior to the Cooper system. The discussion of the paper was generally favorable to the plan developed.

The New York, New Haven & Hartford has contracted with the Travelers Insurance Company of Hartford, Conn., for life and accident insurance for its officers below superintendent, to be paid for in about equal shares, half by the company and half by the insured individual, and has given all eligible persons until October 1 to accept the plan. At least three-fourths of the eligibles must join in the movement in order to make it effective. The scheme is confined to "supervisory and subordinate officials" in the transportation, mechanical and maintenance of way departments and provides for life and accident insurance, without medical examination, to remain in force as long as the person insured remains in the employ of the company and pays his share of the premiums. If he leaves the employment, he may continue his insurance without medical examination by an arrangement with the insurance company.

Reports which have been filed by the safety section of the American Railway Association to indicate the success of the highway crossing campaign inaugurated June 1, show that on 66 of the class 1 roads 352 people were killed at highway grade crossings during June and July of this year, which is an increase of 35 over the number for the same month in 1921. Several roads, however, reported a reduction in accidents, of these, the Chicago & North Western reported four less deaths and twelve less injuries in June and July than in the same period for 1921; the Baltimore & Ohio, ten fewer fatalities and nine less injuries; the New York Central, one less fatality and 28 fewer injuries and the Central of New Jersey, 13 fewer fatalities and 23 fewer injuries. Incident to the highway crossing campaign the safety section reported that widespread publicity has been given the public through the medium of posters, newspapers, lectures and other means and the suggestion is made that in the face of the fact that as 1,300,000 new automobiles were placed in service since the inauguration of the campaign (which is as many machines as there were posters placarded) an increase of only 35 fatalities over the number reported for last year indicates creditable success made in the campaign.

Personal Mention

General

S. H. Osborne, division engineer of the Nebraska division of the Union Pacific, with headquarters at Omaha, Neb., has been promoted to acting assistant superintendent of the Nebraska division with the same headquarters.

A. L. Grandy, chief engineer of the Pere Marquette, with headquarters at Detroit, Mich., has been promoted, effective September 25, to the newly created position of assistant to the president and general manager, with the same headquarters.

A. B. Atwater, assistant to the president of the Grand Trunk, lines west of the Detroit and St. Clair rivers, with headquarters at Detroit, Mich., and who was employed in the engineering department for several years, has retired from active service. Mr. Atwater was born in November, 1845, at Sheffield, O., and entered railway service in 1864 as a telegraph operator on the Cleveland & Erie. From October, 1865, to June, 1885, he was consecutively in engineering service on the Jamestown division of the Cleveland & Erie; resident engineer on construction of the Canadian Southern; assistant engineer of the Port Dover & Lake Huron; general superintendent of the Georgian Bay & Lake Huron division of the Grand Trunk and chief engineer of the Chicago & Grand Trunk. He was promoted to superintendent of the Grand Trunk, lines west of the Detroit river in June, 1885, and held the position until July 12, 1898, when he became assistant general superintendent of the Michigan Central. He held this position until July, 1902, when he was appointed assistant to the president of the Grand Trunk, lines west of the Detroit and St. Clair rivers, the position he held at the time of his retirement.

Engineering

T. J. Bivens, assistant engineer on the Colorado division of the Union Pacific, has been promoted to acting division engineer of the Nebraska division, with headquarters at Omaha, Neb., succeeding **S. H. Osborne,** promoted.

F. D. Lakin, division engineer of the Meadville division of the Erie, with headquarters at Youngstown, Ohio, has been appointed acting regional engineer, with the same headquarters, succeeding H. Knight.

H. A. Cassil, engineer maintenance of way of the Pere Marquette, was promoted to chief engineer, with headquarters at Detroit, Mich., effective September 25, to succeed **A. L. Grandy,** promoted to assistant to the president and general manager.

T. L. Doyle, assistant division engineer of the Mackinaw division of the Pennsylvania, has been promoted to assistant to the chief engineer of the Pennsylvania-Detroit Railroad, with headquarters at Detroit, Mich., and **Ray Stephens,** assistant in the engineer corps of the Mackinaw division, has been appointed acting assistant division engineer of that division.

R. L. Longshore, track supervisor on the Wabash, with headquarters at Chicago, has been promoted to assistant engineer, with headquarters at St. Louis, Mo., in place of **W. R. Bennett,** who has been transferred to Moberly, Mo., succeeding **R. R. Copeland,** who takes the position of assistant engineer occupied by **H. E. Scott,** who has been transferred to Montpelier, O. **R. P. Long** has been appointed assistant engineer at Moberly, Mo., in place of **H. B. Pilcher,** who has been appointed track supervisor at Montpelier, O., as noted elsewhere in this issue.

L. A. Hodgson, assistant engineer in the valuation department of the Midland Valley, has been promoted to assistant valuation engineer, with headquarters at Muskogee, Okla. Mr. Hodgson was born May 13, 1889, at Philadelphia, Pa., and graduated from the University of Delaware in 1911 as a civil engineer. In July, 1911, he was employed by J. C. Conn, contractor for the Georgia Light & Power Company, Atlanta, Ga., as a transitman on dam construction. From April, 1912, to June, 1915, he was an inspector of railway and building insulating materials for the Delaware Hard Fibre Company at Wilmington, Del. He entered railway service on July 12, 1915, in the valuation department of the Pennsylvania and served in various capacities up to the position of structural pilot engineer, which he held until September 16, 1921, when he became valuation engineer of the Maryland & Pennsylvania. On March 1, 1922, he entered the valuation department of the Midland Valley as an assistant engineer, which position he held at the time of his recent promotion.

C. E. Dare, whose recent promotion to engineer maintenance of way of the Richmond, Fredericksburg & Potomac with headquarters at Alexandria, Va., was announced in last month's issue, was born at Rising Sun, Md., on September 2, 1870. Mr. Dare graduated from Lafayette College in 1892, entering railroad service as a rodman in the construction department of the Pennsylvania railroad in February 1893, remaining in that department until 1901 when, as an assistant to the assistant engineer, he was transferred to the Philadelphia division with headquarters at Philadelphia. In 1903 he was promoted to chief draftsman of the Philadelphia Terminal division, remaining in that position for a year when he was promoted to assistant supervisor with the same headquarters. In 1906 he entered the service of the Richmond, Fredericksburg & Potomac as a supervisor with headquarters at Alexandria. In 1919 he was promoted to resident engineer with the same headquarters, remaining in this position until his recent promotion to engineer maintenance of way.

H. D. Row, whose promotion to division engineer of the Marion and Chicago division of the Erie, with headquarters at Huntington, Ind., was noted in last month's issue, was born at Galion, O., on November 8, 1888. He received his education at Ohio State University and entered railway service in June, 1906, as a track supervisor's clerk on the Erie. He continued in this position and that of rodman until September, 1907, when he entered Ohio State University. He returned to the Erie in June, 1912, working on track work during the construction of the yard terminal at Marion, O., and in August, 1912, was appointed assistant division engineer of the Cincinnati division, later being appointed an assistant engineer in the general office at Cleveland. He was promoted to track supervisor of the Meadville division in February, 1916, and in April, 1918, was appointed assistant division engineer of the Delaware and Wyoming division. Transferred to the Kent division on February 1, 1920, he remained on this division until April 1, when he was promoted to division engineer of the Cincinnati division. Later as a result of a reorganization, he was made assistant engineer at Marion, O., and was holding this position at the time of his recent promotion.

Track

S. Jenson has been appointed district roadmaster on the Cascade division of the Great Northern, with headquarters at Burlington, Wash., in place of **U. Sowa,** deceased.

F. L. Weeks has been appointed assistant roadmaster on the Second district of the Plains division of the Atchison, Topeka & Santa Fe, with headquarters at Shattuck, Okla.

Henry McLaughlin has been appointed supervisor of track on the Canadian division of the Pere Marquette, with headquarters at St. Thomas, Ont., succeeding **Henry Morris,** deceased, as noted elsewhere in this issue.

Henry Hoge has been appointed supervisor on the Louisville division of the Southwestern region of the Pennsylvania System, with headquarters at Columbus, Ind., succeeding **G. Whisman,** deceased.

H. B. Pilcher, assistant engineer on the Wabash, with headquarters at Moberly, Mo., has been appointed track supervisor, with headquarters at Montpelier, O., succeeding **S. N. Crowe,** who has been transferred to Chicago, in place of **R. L. Longshore,** promoted.

G. F. Mathey, assistant supervisor of track on the Pennsylvania railroad with headquarters at Gallitzin, Pa., has been promoted to supervisor of track with headquarters at Titusville, Pa., succeeding **C. F. Miller,** transferred to Gallit-

zin. **F. H. Bentley,** supervisor of track with headquarters at Gallitzin, has been transferred to Carnegie, Pa., succeeding **Simon Clarey** who has been assigned to the position of maintenance of way inspector on the Eastern Ohio division. **C. W. Jenkins,** assistant supervisor of track, has been transferred to Gallitzin to succeed Mr. Mathey.

John S. Healy, whose promotion to roadmaster on the Southern Minnesota division of the Chicago, Milwaukee & St. Paul, with headquarters at Madison, S. D., was noted in last month's issue, was born on August 18, 1880, at Cleveland, Minn. He entered railway service in 1900 as a section laborer on the Chicago Great Western at Faribault, Minn., and in 1901 worked with a steel gang on the Burlington, Cedar Rapids & Northern. Mr. Healy entered the service of the Chicago, Milwaukee & St. Paul on March 28, 1902, as a section foreman, later serving as an assistant extra gang foreman and as an extra gang foreman on the Iowa and Minnesota division until 1908. From that time to 1912, he was section foreman at Mendota, Minn., and in the latter year was transferred to Faribault, Minn., which position he held until March 15, 1922, when he was promoted to assistant roadmaster on the Southern Minnesota division, the position he held at the time of this recent promotion.

Bridge and Building

Joe Alsup, supervisor of bridges and buildings on the Shreveport district of the Missouri, Kansas & Texas, with headquarters at Greenville, Tex., has been transferred to a similar position, with headquarters at Oklahoma City, Okla., to succeed **A. S. Clopton,** deceased.

William C. Harman, whose promotion to supervisor of bridges and buildings on the San Joaquin division of the Southern Pacific, with headquarters at Bakersfield, Cal., was noted in the September issue, was born on January 8, 1884, at Mansfield, Ohio, and received his education in the engineering department of Stanford University. He entered railway service in 1906 as a rodman on the Southern Pacific and from 1907 to 1916 served as carpenter and bridge inspector on the San Joaquin division. In 1916, Mr. Harman was placed in charge of a bridge gang in which capacity he had charge of the lining of 10 tunnels on the Tehachapi pass. He held this position until August 1, 1922, when he was promoted as noted above.

Fred K. Estes, acting supervisor of bridges and buildings of the Colorado division of the Union Pacific, has been promoted to supervisor of bridges and buildings of the same division, with headquarters at Denver, Colo., succeeding **E. L. Brown,** deceased. Mr. Estes was born on June 12, 1882, at Thorsley, Ala., and entered railway service as a carpenter with the Union Pacific at Manhattan, Kan., in June, 1903. From April, 1908, to November, 1909, he worked as a carpenter in Denver, Colo., and on the latter date became a foreman in the bridge and building department of the Union Pacific, which position he held until May, 1918, when he was promoted to assistant supervisor of bridges and buildings. He was promoted to acting supervisor of bridges and buildings on January 1, 1922, the position he held at the time of his recent promotion.

Obituary

Harry Morris, for the past 25 years track supervisor on the Pere Marquette lines in Canada, died on September 15 at Walkerville, Ont., after a short illness.

A. S. Clopton, supervisor of bridges and buildings on the Missouri, Kansas & Texas, with headquarters at Oklahoma City, Okla., died on August 23.

Paul T. Montgomery, formerly roadmaster on the Great Northern at Grand Forks, N. D., and Sioux City, Iowa, died at his home in White Bear, Minn., on September 4, after an extended illness. Mr. Montgomery was granted a leave of absence on account of ill health somewhat over a year ago.

E. L. Brown, supervisor of bridges and buildings of the Colorado division of the Union Pacific, with headquarters at Denver, Colo., died on August 13. Mr. Brown was born on July 8, 1856, in Dunham Province, Quebec, and entered the service of the Union Pacific in 1883 as a carpenter in the bridge and building department. In 1890 he was promoted to foreman and from 1905 to 1910 was supervisor of bridges and buildings of the Kansas division, being transferred in the latter year to the Colorado division, where he was located at the time of his death.

A. D. Schermerhorn, assistant division engineer of the Nebraska division of the Union Pacific, with headquarters at Omaha, Neb., died on July 17. Mr. Schermerhorn was born on January 12, 1860, at Quincy, Ill., and served the Union Pacific in various capacities including axman, rodman and assistant engineer, until December, 1884, when he was promoted to division engineer of the Nebraska division. He became assistant division engineer in October, 1920.

W. A. Drake, assistant to the vice-president of the Atchison, Topeka & Santa Fe, with headquarters at Prescott, Ariz., and at one time chief engineer of the Santa Fe, Prescott & Phoenix, died on August 19. Mr. Drake was born in 1848 at Franklin, N. Y., and studied civil engineering at the Delaware Institute. He entered railroad service in 1868 with the New York & Oswego Midland (now the New York, Ontario & Western), and continued with this company consecutively as topographer, instrumentman and division and bridge engineer until the spring of 1871. From 1871 to 1876 he was engineer of the Rome, Watertown & Ogdensburg railroad. He was with the Syracuse, Geneva & Corning Railroad as contractor's engineer from 1876 to 1878. On this date he entered the employment of the Atchison, Topeka & Santa Fe and served as division engineer until 1879. From that date to 1882 he was locating and resident engineer of the Atlantic & Pacific Railroad. On the latter date he was promoted to chief engineer of that road and retained this position until 1885, when he was appointed assistant engineer of the Atchison, Topeka & Santa Fe in Kansas and Indian Territory. During the following year he was in charge of the Denver & Canon City extension of the same road. In 1888 he was appointed superintendent of the Western division and remained in this capacity until 1891, when he entered the private practice of civil engineering for a year. From 1892 to January, 1895, he was assistant chief engineer of the Santa Fe, Prescott & Phoenix Railway. From the latter date to July 1, 1920, he served successively as chief engineer, general superintendent and chief engineer, and general manager of the same road now known as the Santa Fe, Prescott & Phoenix lines, Atchison, Topeka & Santa Fe. His next promotion was on July 1, 1920, when he was appointed assistant to the vice-president, the position he held at his death.

The Pennsylvania System operated throughout the year ended May 31, 1922, without a passenger being killed in a train accident.

The latest means adopted to effect the building of the Moffat tunnel in Colorado, 6.4 miles in length, which has long been proposed for construction about 40 miles west of Denver on the Denver & Salt Lake, as a means of reducing excessive grades on that line, is now being tested in the Colorado courts to ascertain its constitutionality. This plan as contained in a bill recently passed by the state legislature consists briefly of formation of the territory tributary to the tunnel into an improvement district to be assessed for any deficiencies in the funds available from the revenues for paying interest on the bonds.

The Chicago, Burlington & Quincy completed its seventy-second year of service on September 2, having commenced serving the public on September 2, 1850, under the name of the Aurora Branch railroad with tracks extending from Aurora, Ill., to Turner Junction (West Chicago), a distance of 12 miles. The road was built to meet local requirements, its equipment consisting of one locomotive, one passenger coach and two combination baggage and freight cars, and the promoters of the road harbored no idea of extending the line beyond the boundaries of Illinois. The management, however, during the years following took advantage of the opportunities presented to build a large transportation system until today the Burlington has 9,389 miles of line, 1,955 locomotives, 1,389 passenger cars and 72,131 freight cars and employs more than 50,000 officers and employees.

Construction News

The Atchison, Topeka & Santa Fe will construct an underground crossing with 80 ft. girders on concrete abutments at Britton, Okla. This company will also construct a subway with steel superstructure under two tracks at Twenty-third street, Oklahoma City, Okla. This company has authorized the construction of the main section and south approach of the Goddard avenue viaduct at Argentine, Kan. This company has awarded a contract to the Truscon Steel Company, Detroit, Mich., for the sash for the new boiler and tender shops at Albuquerque, N. M.

The Atchison, Topeka & Santa Fe has obtained authority from the Interstate Commerce Commission to construct two branch lines in Osage County, Okla., one beginning at a point 1.7 miles north of Burbank and extending 6.24 miles in a northeasterly direction through De Noya, and the second beginning at De Noya Junction on the above branch and extending 2.97 miles in an easterly direction. Construction of the two lines was begun on February 4, 1922, but at the time it was intended to operate them as spur tracks. This company has awarded a contract for a machine shop at Waynoka, Okla., to E. Ware, El Paso, Tex., and a contract for the sash work for this building to the Truscon Steel Company, Detroit, Mich.

The Baltimore & Ohio has awarded a contract to the Vang Construction Company, Cumberland, Md., for the erection of a 65-ft. through plate girder span highway bridge over its tracks at Collingdale, Pa., and a contract to the Seaboard Construction Company, Philadelphia, Pa., for the erection of a bridge over Elk creek, Clarksburg, W. Va., to consist of two 60-ft. deck plate girder spans with timber trestle approaches. To the same company has been awarded a contract for a 78-ft. through plate girder highway bridge at West Alexander, Pa.

The Canadian National has received tenders for the grading of an earthen water supply dam and spillway at Radville, Sask., the construction of a 5 ft. by 5 ft. reinforced concrete culvert on the Lovell subdivision, Alta., and one 5 ft. by 7 ft. culvert on Bulkley subdivision, B. C., and the erection of 28 miles of fencing between Lintlaw, Sask., and Kelvington.

The Chicago & Eastern Illinois has disposed by sale of that portion of its line extending between West Melcher, Ind., La Crosse and Goodland, and the Illinois-Indiana state line, to a new company comprised largely of farmers, mine owners and grain elevator operators in the vicinity. The road will hereafter be known as the Chicago, Attica & Southern.

The Chicago & North Western closed bids September 9 for 250 bunk houses 20 ft. by 72 ft. to be constructed along its lines.

The Chicago & Western Indiana is working on plans for a new passenger terminal on its present location at Chicago with facilities sufficient to accommodate the roads using the present terminal and the roads using the La Salle and Grand Central stations.

The Chicago, Burlington & Quincy closed bids September 29 for a one-story brick reclamation plant, 50 ft. by 301 ft., at Eola, Ill.

The Chicago, Burlington & Quincy closed bids on September 25 for the construction of a passenger station 24 ft. by 100 ft. at Clarence, Mo., and closed bids on September 29 for a 50-ton coaling stations at Clarinda, Iowa, and has awarded contracts respectively to the Home Builders' Association, Wichita, Kan., for a power house at Alliance, Neb.; to the Jones Engineering Company, Omaha, Neb., for an addition to the power house at Lincoln, Neb.; to G. A. Johnson & Sons, Chicago, for a passenger station at Elsberry, Mo.; to W. G. Zitterell, Webster City, Iowa, for a freight house at Ziegler Junction, Ill., and to G. A. Johnson & Sons, Chicago, for a freight house at Aurora, Ill. This company, which was reported in the May issue as preparing plans for the construction of shop facilities at Denver, Colo., has awarded a contract for this work to the Stearns-Rogers Company, Denver.

The Chicago, Milwaukee & St. Paul has been ordered by the Board of Railroad Commissioners of South Dakota to build a freight and passenger station at Beardsley, S. D.

The Chicago, Rock Island & Pacific closed bids during the month for the construction of a one-story passenger station 40 by 330 ft. at Moline, Ill.

The Chicago Union Station recently called for bids for the widening of Canal street, Chicago, from Harrison street 225 ft. north. This company closed bids during the month for the construction of concrete track side slabs and track drainage system for the north approach tracks, the installation of fibre conduit for high and low tension leads between Washington and Lake streets and the excavation for permanent stations tracks between Van Buren and Harrison streets. This company has awarded a contract to the Underground Construction Company, Chicago, for the construction of a concrete trucking subway extending north of Harrison street, Chicago.

The Denver & Rio Grande Western has petitioned the United States District Court at Denver for authority to spend in excess of $23,000,000 in rehabilitating its property of which an expenditure in excess of $15,000,000 is intended for additions to fixed property with approximately $6,000,000 to be spent for new rail and about $3,000,000 for new shops.

The Elgin, Joliet & Eastern will construct a 75 ft., double track deck plate girder span with ballast floor and a 25 ft. approach span across the Grand Calumet river at Gary, Ind.

The Florida East Coast has applied to the Interstate Commerce Commission for a certificate authorizing an extension from Okeechobee to Miami, Fla., 125 miles. The line is to develop the Everglades south and east of Lake Okeechobee and open a territory practically devoid of any means of transportation. The extension would also afford a separate through line inland from Miami to Smyrna, 240 miles, which would serve as a second main line.

The Grand Trunk will close bids October 4 for a two-story brick freight house, 20 ft. by 32 ft., at Harvey, Ill.

The Green Bay & Western has awarded a contract to the Ogle Construction Company, Chicago, for coal handling machinery for a 200-ton frame coaling station at Whitehall, Wis., to be erected by company forces.

The Houston & Brazos Valley has been authorized by the Interstate Commerce Commission to construct an extension from a point near Clute to Hoskins Mound in Brazoria county, Texas, 13 miles.

The Long Island is making improvements at Morris Park, L. I., to include a new office building and a new storehouse, both of reinforced concrete.

The Illinois Central will construct additional storage tracks at Manchester, Iowa, and passing tracks at Gilman, Ill., Weedman and Guthrie, and at one other place, and will improve its water facilities to the extent of $15,000 at Peosta, Ia.; $20,000 at Kinmundy, Ill.; $9,000 at Pana; $21,000 at Ramsey; $27,000 at Memphis, Tenn., and $18,000 at Champaign, Ill. This company will also improve its coal handling facilities at McComb, Miss., at a cost of $69,000, and its air testing facilities at Dubuque, Ia., at a cost of $10,000. Passing tracks will also be constructed at Dowell, Ill., Lenzberg, and Marion. Passing and yard tracks will be extended at Marissa, Ill., at a cost of $76,000, and passing and storage tracks will be constructed at Cambria, Ill., at a cost of $25,000.

The Illinois Central has awarded a contract to the States Contracting Company, Chicago, for the depressing of its tracks from Twenty-fifth to Forty-third streets, Chicago, and raising tracks from Forty-third to Forty-ninth streets, incident to the terminal construction to be carried on in that city, and has awarded a contract to Ellington Miller Company, Chicago, for remodeling the freight house with new concrete paved transfer platform at Indianapolis, Ind., to cost $45,000. This company, which was reported in the September issue as calling for bids for the rebuilding of 12 water treating plants, and as having awarded the contracts for the construc-

tion of 8 of these plants, has awarded the contract for the remaining four situated at Dunlap, Iowa, and Manchester, and at La Salle, Ill., and Scales Mound, to the International Filter Company, Chicago. This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for altering its fruit sheds at Mounds, Ill., and has awarded a contract to Mortimer & Lindstrom, Chicago, for the construction of a 12-in. and a 15-in. sewer in connection with the rearrangement of sewers across the right-of-way between Twenty-fifth and Fifty-first streets, Chicago. This company has also awarded a contract to the Underground Construction Company, Chicago, for the construction of a circular brick sewer, 7-ft. in diameter, on Rhodes avenue, and a contract to the Great Lakes Dredge & Dock Company, Chicago, for driving 1,100 ft. of new breakwater between Twenty-ninth and Thirty-first streets, Chicago.

The Jefferson Southwestern has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line from a connection with the Chicago & Eastern Illinois near Mt. Vernon, Ill., to a connection with the Chicago, Burlington & Quincy, 3 miles south of Waltonville, Ill., 14.5 miles.

The Kansas, Oklahoma & Gulf is preparing plans for the extension of approximately 6½ miles of its lines from Baxter Springs, Kan., to a connection with the Joplin branch of the Missouri, Kansas & Texas.

The Lake Superior & Ishpeming will construct a steel repair shop, 69 ft. by 301 ft., a paint and coach shop, 48 ft. by 100 ft., and a woodmill, 47 ft. by 100 ft., at Marquette, Mich., the total cost of which is estimated at $250,000.

The Lehigh & New England has awarded a contract to the Tilghnam Moyer Company, for the construction of a concrete and brick freight station at Allentown, Pa., to cost approximately $40,000.

The Michigan Central has awarded a contract to the Ellington Miller Company, Chicago, for a three-story office building, 60 ft. by 75 ft., at Detroit, Mich., to cost approximately $80,000.

The Minneapolis, St. Paul & Sault Ste. Marie, reported in last month's issue as accepting bids for a 20-stall roundhouse at Gladstone, Mich., has awarded the contract to Smith & Vandanaker, St. Paul, Minn.

The Missouri Pacific is receiving bids for the construction of a car repair shop 120 ft. by 510 ft. at Kansas City, Mo., and has awarded a contract to Herman & McCain Construction Company for a passenger station 24 ft. by 100 ft. at Lake Village, Ark.

The Oregon, California & Eastern, which operates a railroad between Klamath Falls, Ore., and Hildebrand, a distance of 24 miles, will within the next few months, extend its line to Squaw Flat and is working on seven miles of line extending to Bonanza, which it expects to complete early in 1923. The construction of another branch line known as the Swan Valley branch has also been undertaken, which will extend from a point 15 miles northeast of Klamath Falls. The company contemplates eventually extending northward to Bend, Ore., where it will connect with the Oregon-Washington Railroad & Navigation Company and the Oregon Trunk Line. In all, surveys for 423 miles of line have been completed and a large part of the right-of-way obtained. The cost of the entire project will be $10,000,000, much of which has been raised locally.

The Pennsylvania is receiving bids for the construction of the substructure of an overhead bridge at Josephine, Pa., which will involve: 1,050 cu. yd. foundation excavation, 430 cu. yd. foundation masonry, and 975 cu. yd. neat masonry. The work is in charge of George Nauman, assistant to chief engineer, Pittsburgh, Pa. This company has awarded a contract to W. E. Wood for the construction of the foundation of a 60 ft. by 700 ft. freight house at Third and Larned streets, Detroit, Mich., and a contract for the construction of a 60 ft. by 120 ft. frame engine house at Lincoln Park. The company has also awarded a contract to Meredith & McVaugh for the paving of the driveways of its Summit street yard in that city, the main engine house for which is to be built by the Pere Marquette at a cost of approximately $1,000,000, embracing a huge turntable, water tower, coaling stations and other essential buildings, and is receiving bids for all the work necessary to complete the Baltimore, Md. (Canton), No. 3 yard.

The Philadelphia & Reading has now under way and expects to complete for the 1923 summer season, the construction of extensive additions to its ferry and track facilities at Camden, N. J. Plans call for a two-story structure of steel, frame and brick, which will house the ferry slips, the train shed, the 105 ft. by 328 ft. concourse, waiting rooms, restaurants and offices of the Delaware River Ferry Company and of the Seashore lines of the Philadelphia & Reading.

The Southern Pacific will construct a new five span steel girder bridge approximately 929 ft. long across the Rio Grande river at Eagle Pass, to cost about $225,000. The bridge will be owned jointly by the Mexican National and the Southern Pacific. This company is building extensions to its sidings at Crystal Lake, Cal., Cisco, and Troy, at a cost of approximately $250,000 and is engaged in double-tracking 23 miles of line between Bakersfield, Cal., and Sievert and from Tehachapi to Cameron, this work to cost approximately $1,000,000. Incident to the double-tracking work, the company is also enlarging and relining tunnels at San Fernando, Cal., and Hasson, involving an expenditure of approximately $1,800,000. This company is also contemplating extensive grade reduction work and double tracking as well as other improvements on the Central Pacific portion of the system, particularly over the Sierra Nevada mountains and through Nevada.

The Union Pacific is receiving bids for the extension and repairing of its passenger station at Kearney, Neb. This company, in conjunction with the city of Denver, Colo., has awarded contracts for the Broadway viaduct of steel truss and girder spans having a total length, including embankment and reinforced concrete approaches, of 2,257 ft. C. S. Lambic & Company, Denver, was awarded the contract for the concrete substructure of the viaduct proper and D. Munro, of Kansas City, Kan., for the reinforced concrete work in the approaches. The steel superstructure will be furnished by the American Bridge Company and erected by the Kansas City Bridge Company. This company has also awarded a contract for an addition to its passenger station at Cheyenne, Wyo., to H. W. Baum Company, Salt Lake City, Utah, and has awarded a contract to the Graver Corporation of Chicago, for the erection of a 200,000-gal. steel water storage tank at Ogallala, Neb., and an 800,000-gal. steel water storage tank at Council Bluffs, Ia.

The Vancouver Harbor Terminal Railway through Consul General F. M. Ryder, Vancouver, B. C., reports the completion of plans for the construction of the first section of this railway, which is to connect the Great Northern with various piers and docks at an estimated cost of $80,000. The project is under the direction of the Vancouver Harbor Commission and work will be undertaken following the naming of a new harbor board.

The Western Pacific has secured all necessary franchises and met all legal requirements for the construction of six miles of industrial tracks in Stockton, Cal. Contracts have been let to the Utah Construction Company and it is expected that the initial trackage will be ready for ballasting by winter.

Equipment and Supplies

The St. Louis-San Francisco recently inquired for 600 tons of structural steel.

The Louisiana & Arkansas has ordered 1,200 tons of structural steel from the Virginia Bridge & Iron Company for its shops at Stamps, Ark.

The Missouri Pacific has ordered 275 tons of structural steel from the American Bridge Company.

The New York Central has placed orders for 194,300 tons of rail for the New York Central Lines as follows: Illinois Steel Company, 74,500 tons; Carnegie Steel Company, 16,464 tons; Bethlehem Steel Company, 85,036 tons; Inland Steel Company, 15,800 tons, and Cambria Steel Company, 2,500

The Union Pacific has placed an order with the American Bridge Company for 2,735 tons of structural steel.

Supply Trade News

General

The Bethlehem Steel Corporation and the **Lackawanna Steel Company** has secured approval at recent meetings of the stockholders of these companies, a merger which, it is planned to effect between the two companies as announced in the June issue.

The National Lock Washer Company, Newark, N. Y., is building a new two-story brick structure, 84 ft. by 40 ft., at the corner of Pennington and Hermon streets, the top floor of which will be used for office purposes and the ground floor for shipments. The company is also putting up a steel storage building 100 ft. by 60 ft. for additional storage purposes and is also rearranging the equipment in its fabricating machine shop and making general improvements throughout the entire plant.

The Walworth Realty Company, a subsidiary of the Walworth Manufacturing Company of Boston, has awarded a contract to Dwight P. Robinson & Company, Inc., for the design and construction of a warehouse, pipe shop and garage to be located on Jackson avenue, Long Island City. The main building will contain the offices, city sales department, shipping room and space for the storage of fittings and material. The pipe storage building is to be 60 by 214 ft. and will be served by a crane running out over the railroad siding.

The Ramapo Iron Works of Hillburn, N. Y., with plants at Hillburn and Niagara Falls, N. Y., and Niagara Falls, Ont., and the **Ajax Forge Company** of Chicago, with plants at Chicago and Superior, Wis., have been consolidated under the name of the **Ramapo-Ajax Corporation,** with **J. B. Strong,** vice-president of the Ramapo Iron Works, as president. The control of the new company will be held by the American Brake Shoe & Foundry Company, New York. Mr. Strong graduated from Sheffield Scientific School, Yale University, in 1896, after which he entered the employ of Wm. Wharton, Jr., & Company as a draftsman on frog and switch work, later becoming assistant engineer on the relocation and construction of the line of the Nova Scotia Southern from Shelburne, N. S., to Halifax. In 1897 he returned to engineering work in the United States and on January 1, 1901, became assistant engineer on the Metropolitan Street Railway of New York City. In 1902 he was appointed an assistant engineer in the chief engineer's office of the New York Central at New York City and in 1903 was made chief engineer of the McPherson Switch & Frog Company, Niagara Falls, N. Y., which concern was consolidated with the Ramapo Iron Works a few months later. After remaining at Niagara Falls for two years in charge of the construction of a new plant, Mr. Strong was transferred to the headquarters of this company at Hillburn, where he served successively as special engineer on estimates and designs of frog and switch equipment, assistant general manager and chief engineer and vice-president and general manager, the position he held until his recent promotion. Mr. Strong, has also been active in the work of the Manganese Track Society and the National Railway Appliances Association, of which latter organization he was president in 1920-21.

J. B. Strong

Personal

H. C. Thomas, general superintendent of the United Alloy Steel Corporation, Canton, Ohio, has been promoted to assistant general manager.

John H. Flagler, who organized the National Tube Company and served as its president until it was merged with the United States Steel Corporation, died on September 8 at his country home in Greenwich, Conn.

H. C. Mull, in charge of railway sales for both the Reliance Manufacturing Company, Massillon, Ohio, and the Warren Tool & Forge Company, Warren, Ohio, with headquarters at Chicago, has resigned from the former company and will hereafter represent only the latter, with headquarters at Warren, Ohio.

C. T. Pratt, treasurer of the Brown Hoisting Machinery Company, Cleveland, Ohio, has resigned and **A. C. Brown,** president of that company, has assumed the additional duties of treasurer. **J. F. Pierce** has resigned as auditor and director of the same company, which vacancy probably will not be filled for the present.

J. G. Carruthers, manager of sales, Chicago district, of the Illinois Steel Company, and special sales agent of the Carnegie Steel Company, with headquarters at Chicago, has resigned to become general sales manager of the Otis Steel Company, Cleveland, Ohio. He will be succeeded by **D. T. Buffington** of the structural and plate bureau, general sales department, Illinois Steel Company.

John S. Ruble, who recently resigned as vice-president of the Austin Company, has been elected vice-president in charge of all construction of the H. K. Ferguson Company, engineers and builders, Cleveland, Ohio. Mr. Ruble graduated in mechanical engineering from Pennsylvania State College in 1901 and for four years engaged in dock ore storage and unloading equipment design and construction with Hoover & Mason, contracting engineers. He subsequently served for eight years as an engineer with the U. S. Steel Corporation at various places, then as construction engineer for the Tennessee Coal, Iron & Railroad Company at Birmingham, Ala.

Trade Publications

Anti-Creepers.—An illustrated booklet of eight pages has been issued by the P. & M. Company, Chicago, discussing spacing of ties, slot spiking of joint ties and setting forth the several advantages arising from the use of proper track fastenings.

Wood Preserving Terms.—The Protexol Corporation, New York, has recently issued an 86-page booklet by Ernest F. Hartman and E. F. Paddock, containing a large list of wood preserving terms and their definitions. Many terms which are of a technical nature have been included as well as the more strictly industrial ones. In addition, references have been given to facilitate further inquiry and study.

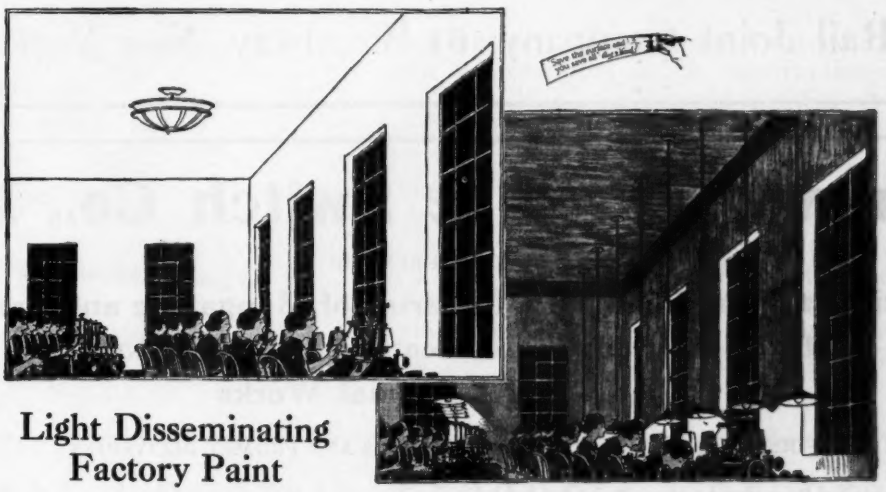
Cinder Plants.—In a four-page folder issued by Roberts & Schaefer Company, Chicago, the N & W type cinder plant built by the company is illustrated and described. The text matter takes the form of a list of 11 advantages, while a diagram clearly shows the construction and method of operation.

Daylight the Natural Illuminant.—The Skybryte Company, Cleveland, Ohio, has prepared a treatise of 48 pages, attractively bound in cardboard, on the principles of daylight illumination and of the relation between adequate illumination and efficient workmanship. The book is well illustrated and contains information of value to the engineer interested in the design of shops and similar buildings.

During the first six months of the year the railroads of the United States handled 170,209,000,000 net tons of freight as compared with 163,587,000,000 for the first six months of 1920, according to statistics compiled by the Interstate Commerce Commission. The report shows further that the average percentage of unserviceable locomotives for the first six months was 23.4 and of cars 13.8 and that the average car miles per day was 22.7 as compared with 21.5 last year.

Save Coal!

Light your plant with proper paint



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Saves in coal where plants generate their own light and saves in dollars where current is bought.

Many modern plants are built to take every advantage of natural light. Although sunlight may darken ordinary light reflecting paints, paint made with The New Jersey Zinc Company's

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embodies a distinctly individual achievement. It does not darken from sunlight on the brightest days and on dark days it produces maximum dissemination of light throughout the factory space. Write us for our factory lighting formula, combining The New Jersey Zinc Company's Zinc Oxide and Albalith.

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Massey Concrete Products Corporation
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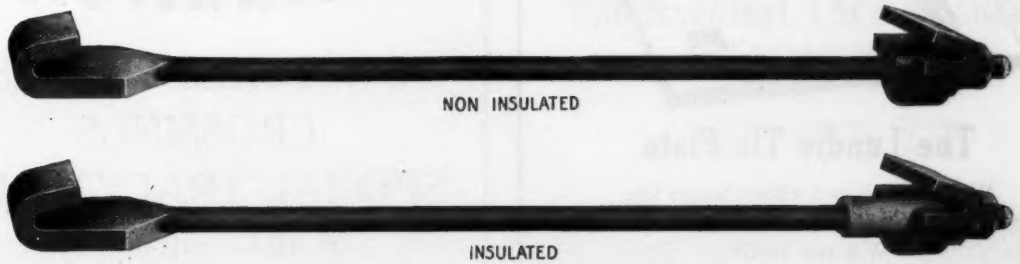
Bethlehem Gage Rods



Bethlehem Gage Rods recommend themselves to roads wishing to carry but one style of rod for both insulated and non-insulated service. The simple addition of a fibre bushing converts the non-insulated rod, Design 855, to the insulated rod, Design 856.

The rod itself is made in one piece of rolled and forged steel, and the adjustable jaw is forged from a ¾ inch steel plate. The fibre bushing used only in the insulated design is well protected and does not come in contact with any part subject to heavy wear.

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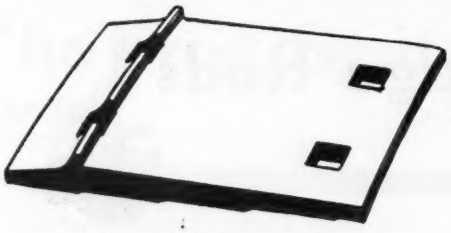

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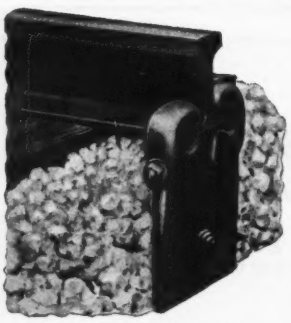
Will give rail and wheels longer life.
Will hold gauge and not injure a single fibre of the tie.
Will not rattle.



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Requires only one anchor per rail.
Will hold in both directions.

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SPECIAL TRACKWORK
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Immediately—Permanently and Adequately Active

IMPROVED HIPOWER NUT LOCKS are so designed that they permanently and adequately maintain the stress imparted to a track bolt by initial wrenching in anticipation of and in preparation for the super stresses induced by traffic.

IMPROVED HIPOWER has greater thickness and more curves than the standard shape to give the enormous reactive pressure necessary.

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We firmly believe that IMPROVED HIPOWER more closely approaches the Ideal Track Nut Lock than any other device heretofore manufactured.

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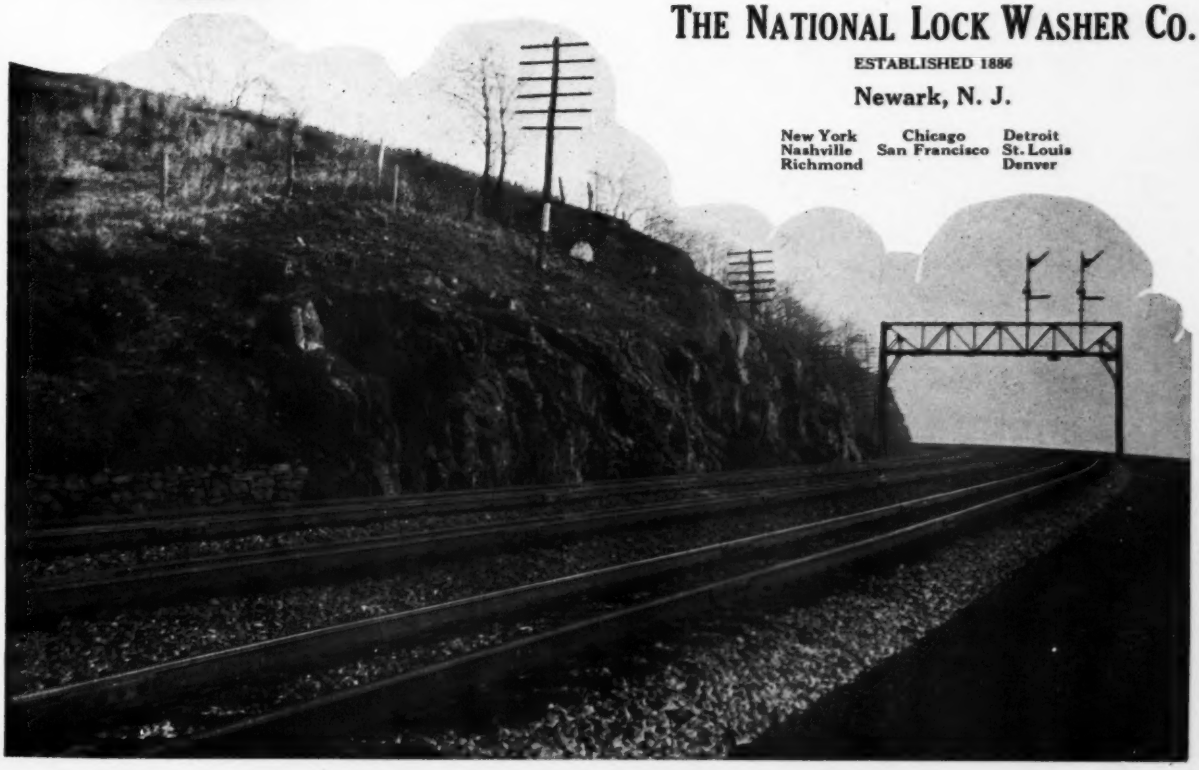
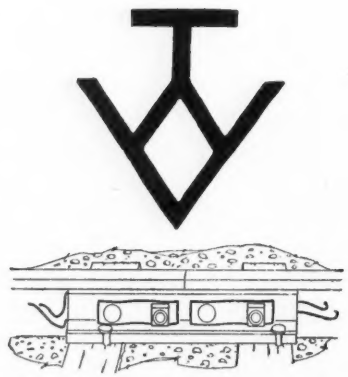


We Make Them Both



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They are made of Pennsylvania Spring Steel Analysis high carbon steel, hot coiled, oil tempered, and annealed, and each and every nutlock is separately tested before it leaves the plant. Thirty-five years' experience in manufacturing them has resulted in a nutlock rarely equalled and never surpassed.

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